University of Alberta

Constructing Natural History in England (1650-1700)

By

Susan McMahon ©

A thesis submitted to the Faculty of Graduate Studies and Research in partial fulfilment of the Requirements for the degree of Doctor of Philosophy

Department of History and Classics

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ABSTRACT

This dissertation reevaluates the roles and practices of Natural History in England (1650-1700), and especially the transformation of natural history from amateur undertaking and virtuoso display to scientific enterprise. At 1650, natural history was not a single and defined activity, but consisted of a broad array of activities practised by a variety of individuals. By 1700, natural history was the disciplined enterprise of an identifiable community of natural philosophers, committed to precise, first-hand observations, agreed upon a scholarly tradition which they represented, and preoccupied with the importance of taxonomy, the natural philosophy of delineating the natural order and relation of things. An examination of the early career of John Ray FRS (1627-1705) allowed me to assess the extent to which Ray both stood within an established tradition and was ultimately responsible for the definition of the culturally dominant tradition in Natural History during the 1690s. Ray maintained an extensive correspondence network, which was composed of independent gentlemen, clergy, medical professionals and Fellows of the Royal Society, which enabled him to play a leadership role in the transition to responsible natural history. Ray was an active Fellow of the Royal Society which sought to become the authoritative voice on matters of natural knowledge and orthodox philosophy, and to legitimate its corporate reputation by appeal to conservative and 'respectable' traditions. During the 1690s the rhetoric of Raian natural history also assumed a deliberate socio-political message in response to urgent concerns in society. This research shows how a community of natural historians organized themselves, defined their knowledge domain, achieved consensus on the nature of their enterprise and constructed a public identity. In sum, the object of my study is the disciplinary transformation of natural history.

TABLE OF CONTENTS

Page

Preface viii

Chapter 1 **"Never leaving the Church in these times of giddiness and distraction": The Shaping of John Ray and His Contemporaries 1642-1660** 2

Religion and Politics 6
The Civil Wars and the County of Essex 11
Cambridge University 18
Conclusion 30
Appendix: Anglican Clergy and Landowning Gentry 33

Chapter 2 **Politics, Polemic and Plants, 1650-1660** 37

Natural History 39
Georgic Literature as Post-Civil War Royalist Trope 42
Botanical Literature and the Royalist Tradition 57
I. Philosophical Neutrality 61
II. Botanical Authority 66
Conclusion 77

Chapter 3 **"So many oathes and subscriptions:" The Act of Uniformity, 1662** 78

The Restoration and Religious Conformity at Cambridge 80
The Act of Uniformity 1662 86
Conclusion 101

Chapter 4 **Royalists, Anglicans And the Royal Society 1662-1680** 103

The Royal Society 106
Royalists 111
Anglicans 113
Conclusion 136

Chapter 5 **"It being the design of the Royal Society:" Natural History and the Royal Society** 138

Natural History at the Royal Society 139
Historiae 144
Nehemiah Grew's Natural History Project 149
Conclusion 156

Chapter 6 **Inventing Identities** 158

Inventing a 'Scholar and a Gentleman'

I. Europe 1663-1666 160
II. The Search for a Patron 165
Inventing Natural History - Constructing a Community 173
Conclusion 189

Chapter 7 **Ordering the Community** 193

Disciplining the Community 194
I. *Natural History Methodology* 201
II. *Vocabulary* 214
III. *Further Orders* 217
Sustaining the Community 219
Expanding the Community 223
Conclusion 228

Chapter 8 **Honour and Order: Robert Morison 'The King's Botanographer' and John Ray 'socius regius'** 231

Honour and Reputation 234
Nature Ordered 256
Conclusion 263

Chapter 9 **Contingency and Consolidation: Raian Natural History Established 1690-1705** 265

Natural History 267
The Glorious Revolution 272
The Royal Society, John Ray and Natural Theology 279
I) The Wisdom of God 282
ii) The Miscellaneous Discourses 295
Conclusion 300

Chapter 10 **Conclusion** 302

Raian Natural History in the early eighteenth century 303
Inventing John Ray 308
Conclusion 319

Bibliography 320

LIST OF TABLES

Page

Table I Natural History Network 1662-1678 191

Table II Natural History Network by 1690 230

TABLE OF ILLUSTRATIONS

Page

Fig. 1 John Ray, Prince of English Botanists, The Library, Royal Botanic Gardens, Kew 1

Fig. 2 Anglicans and Puritans in Essex, A map 32

Fig. 3 Thomas Sprat, 'Frontispiece', *The History of the Royal Society for the Improving of Natural Knowledge* (London, 1667) 103

Fig. 4 *Pentaphylloides fruitcosum*. John Ray, *Catalogus Plantarium Angliae* (London, 1677) 209

Fig. 5 A common cinquefoil. 211

Fig. 6 John Ray, *Historia Plantarum*, Vol. 1 (London, 1686). 269

Fig. 7 John Ray, *Historia Plantarum*, Vol. 2 (London, 1688) 270

Fig. 8 John Ray, *Historia Plantarum*, Vol, 3 (London, 1704) 271

Preface

The story of natural history in the grand narrative of the scientific revolution has often been a tale of progress and discovery. Natural history was part of the triumphant history of the sciences in so far as scientific rationality rested on a strong tradition of developments in biological classification and of tracing the changing concept of the 'idea' of 'the species'. The story of the great systematists ranged from Aristotle and Theophrastus to encompass the taxonomic work of Andreas Cesalpino (1519-1603), John Ray (1627-1705), Carl Linnaeus (1707-1708) and beyond. Even Michel Foucault's influential *The Order of Things,* for all its postmodern archeological discourse, looked at seventeenth century natural history as the dismantling of an animated, magical world view and its replacement by a rational, taxonomic episteme.[1] Much of our current understanding of seventeenth-century natural history accepts this perspective despite more recent attempts to provide explanations for the development of natural historical knowledge, its practices and its place within scientific institutions.[2]

Natural history has also been relegated to a relatively minor role in the transformation of the seventeenth century. Such interpretations are fortified by the enduring perspective that, without a scientific taxonomy and the 'right' definition of species, natural history was "a confused, undisciplined crowd of subjects" and natural historians were "mere collectors of curiosities and superficial trifles."[3] There has also been a tendency among historians of science to project onto seventeenth-century practice our most recent understanding of the term as the intellectually undemanding description, classification, or quantification of the natural, usually biological, objects of the earth.[4] Michael Hunter, perhaps, expresses the attitude most diplomatically when he alludes to the early Royal Society's undertaking of natural history as "easily caricatured."[5] More generally, early modern natural history continues to be seen primarily as "the programmatic justification for cabinets of curiosities" among the wealthy and fashionable.[6] However, in the late seventeenth century, natural history was also a deliberate, self-conscious undertaking which was practised by a disciplined and identifiable community who were agreed on the aims and intentions of their activities.

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[1] Michel Foucault, *The Order of Things: An Archaeology of the Human Sciences* (New York: Pantheon Books, 1970); see also William B. Ashworth, Jr., 'Natural history and the emblematic world view', *Reappraisals of the Scientific Revolution*, ed. David C. Lindberg and Robert S. Westman (Cambridge, etc.: Cambridge University Press, 1990), pp. 303-332.

[2] See for instance E. C. Spary. *Utopia's Garden: French Natural History from Old Regime to Revolution* (Chicago and London: University of Chicago Press, 2000); and Paula Findlen, *Possessing Nature: Museums, Collecting and Scientific Culture in Early Modern Italy* (Berkeley, etc.: University of California Press, 1994).

One of the difficulties in assessing the place of natural history has been that the intentional undertaking of studying the natural products of the world has changed over the centuries and according to the concerns of participants and their intentions. The Greeks, for instance, conceived the activity of *historia* as an enquiry into what was remarkable. Thus, Aristotle's natural history project was research into the world and a report of those things that he considered significant and worthy of report. Aristotle's inquiries into the natural world were not only consistent with, but contributed to his understanding of the political world. Of central significance to Aristotle's natural history was the understanding that the elements of the natural world were goal directed; that is to say that every individual entity had a nature which directed the 'natural' growth and attributes of that entity. The 'nature' of the thing caused the development of that object in certain ways for certain ends. Natural history was the discovery of purpose and therefore, in Aristotelian terms, natural history was the investigation of the 'natures' of individual entities in an ordered, purposeful and hierarchical natural world. While Aristotle taught about the natures of animals and plants, he also taught about the political natures of different peoples and the proper ordering and purposes of their political worlds. The Greeks were understood to possess natures which endowed them with qualities to fulfill their purpose as political leaders; in the proper ordering of Greek society, others possessed natures which enabled them to fulfill their purpose as servants or slaves.[7] Given Aristotle's own place among the oligarchy of Athens, we would not expect otherwise.

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[3] Harriet Ritvo, *The Platypus and the Mermaid and Other Figments of the Classifying Imagination* (Cambridge MA and London: Harvard University Press, 1997), pp. 15-26, esp. p. 16.

[4] Stephen J. Gould continues to lament that the historical sciences have been undervalued by a 'false ordering of sciences by status" in a "parochial" community which privileges physics and chemistry; *Wonderful Life: The Burgess Shale and the Nature of History* (New York and London: Norton, 1989), pp. 280-281. For perspectives on the transformation of natural history to 'amateur' status, see: D. E. Allen, 'On Parallel Lines: Natural History and Biology in the late Victorian Period', *Archives of Natural History* 25(3) (1998), pp. 361-371; Martin Fichman, 'Biology and Politics: Defining the Boundaries', *Victorian Science in Context*, ed. Bernard Lightman (Chicago: Chicago University Press, 1997), pp. 84-118; Lynn K. Nyhart, 'Natural history and the new 'biology', *Cultures of Natural History*, ed. N. Jardine, J. A. Secord and E. C. Spary (Cambridge, etc.: Cambrdige University Pres, 1996), pp. 426-443; and Adrian Desmond, *The Politics of Evolution: Morphology, Medicine and Reform in Radical London* (Chicago: University of Chicago Press, 1989).

[5] Michael Hunter, *Science and the Shape of Orthodoxy: Intellectual Change in Late Seventeenth Century Britain* (Woodbridge: Boydell Press, 1995), p. 155.

[6] Steven Shapin, *The Scientific Revolution* (Chicago and London: University of Chicago Press, 1996) pp. 65-96, esp. pp. 90-91, p. 187; Katie Whitaker, 'The culture of curiosity', *Cultures of natural history*, ed. N. Jardine, J. A. Secord, E. C. Spary (Cambridge: Cambridge University Press, 1996), pp. 75-90.

The Romans, on the other hand, had no need to justify their imperial power by a study of individual natures achieving their purpose, but were content to explore aspects of the natural world which were useful and appropriate for a vibrant, wealthy and expanding empire. This is evident in the *Natural History of the World* by Pliny the Elder (23-79

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[7] Roger French, *Ancient Natural History: Histories of Nature* (New York and London: Routledge, 1994) pp. 10-18.

AD), who intended an inventory of those things that were visible in the world and in the sky. Pliny was especially concerned to document that which would be of interest to the Roman citizen, so that he recorded not only those aspects of the natural world he found remarkable and worthy of memory, but those entities that would be useful to a Roman's material benefit, his moral welfare or his intellectual enlightenment and entertainment. In addition to an encyclopaedia which included utilitarian categories of living and nonliving entities, Pliny also included a history of human affairs, including arts, crafts and knowledge but also including man's own place in history and its unfolding.[8]

The natural philosophers of the middle ages had their own unique incentives for investigating the natural world, and such studies were especially important aspects of the education program of the Dominican Friars in the thirteenth century. Among the most well known of the natural histories of this period include those of Thomas of Cantimpré and Albertus Magnus. These philosophers, although deriving their inspiration from Aristotle's natural histories, had purposes quite different from the Aristotelian program. Both Thomas and Albert attempted to convince their opponents that the study of the natural world, as a purposeful creation of God, was worthy of the philosopher's investigation. Even more potent however, was Albert's desire to present the natural world as the work of a single, good, and benevolent Creator and therefore the world and all its contents were inherently good in and of themselves.[9] Albert's intentions were not only to 'Christianize' Aristotle, but to use Aristotelian philosophy as a weapon to defend against the heretical belief that God and his earthly creations were evil.

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[8] *Ibid.*, pp.196-255 esp. 206-208; 212-218; 230-233.

[9] Roger French and Andrew Cunningham, *Before Science: The Invention of the Friar's Natural Philosophy* (Aldershot: Scholar Press, 1996), pp. 126-200, esp. 178-183,

By the early modern period, natural history, epitomized by the collection and display of rare and costly objects, had become part of elite culture: natural objects and rarities were no less valued than *objets d'art* among the virtuosi of the sixteenth century. In a culture where the conspicuous display of wealth was seen to be a demonstration of learning, generosity, power and leadership, the possession of nature and the associated display of textual knowledge also implied control of both natural and human resources, in addition to fostering an image of legitimacy for hereditary rulers.[10] Thus the power interests of Europe's highest classes played a fundamental role in promoting the enterprise of natural history and in reinforcing knowledge which perpetuated the values, aims and norms of the highest social groups. Perhaps the most cited and oft quoted promoter of natural history of the period was Francis Bacon, Lord Chancellor of England. Bacon was especially concerned with the civic role of natural history and its interpreters, the natural philosophers. He advocated the development of a state bureaucracy to collect 'perfect histories of nature' and he intended that natural knowledge be utilized in order to augment the powers of the state.[11] Throughout the seventeenth century, both Bacon's name and his writings were appropriated by men with widely different interests from his own. During the 1640s and 1650s, Baconian rhetoric was invoked to advance the social reform program of the Puritans.[12] At the Restoration, gentlemen members of the early Royal Society likewise appealed to Bacon's name to lend legitimacy and authority to their own program for the advancement of natural knowledge.[13]

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[10] Findlen, *Possessing Nature*, pp. 346-392; Lisa Jardine, *Worldly Goods: A New History of the Renaissance* (New York and London: Norton, 1996) esp. pp. 277-330; Mario Biagioli, 'Scientific Revolution, Social Bricolage, and Etiquette', *The Scientific Revolution in National Context*, ed Roy Porter and Mikulas Teich (Cambridge: Cambridge University Press, 1992) ; Lesley B. Cormack, "Twisting the Lion's Tail: Practice and theory at the Court of Henry Prince of Wales', *Patronage and Institutions: Science, Technology, and Medicine at the European Court, 1500-1750*, ed. Bruce T. Moran (Woodbridge: Boydell Press, 1991) pp. 67-84.

[11] Julian Martin, *Francis Bacon, the State and the Reform of Natural Philosophy* (Cambridge, etc.: Cambridge University Press, 1992).

My own story about natural history and about those who participated in the activity during the last half of the seventeenth century rests on the conviction that human activity of whatever description is a result of unique circumstantial accidents. I intend this work to contribute to a body of literature which increasingly attempts to understand natural history as a product of locally situated culture. Thus, my research examines natural history as a cultural and social enterprise of early modern England. I have attempted to understand how and why identifiable groups of individuals engaged in the study of nature in a particular way and at specific historical moments. In approaching natural history as an historically contingent enterprise, I have focussed my attention away from presentist debates concerning the relative value of competing classification systems; these debates tend to obscure the historical meaning of natural history as a self-conscious project of seventeenth-century England and in any event are thoroughly rehearsed in the secondary literature.[14] Rather, my account explores the religious, political and cultural spheres in which natural history was constructed; the content, practices and protocols maintained within the natural history community; and the rhetoric which promoted the study of natural history as a model for consensus and stability in a highly politicised context especially marked by competing claims for authority in church and state as well as natural philosophy. In particular, the political and religious loyalties which were established during the Civil Wars and Interregnum continued to shape public debate after the Restoration of the Stuarts in 1660. The potential to redefine 'respectable' social, political and religious attitudes during the reconstruction of monarchical rule hinged on loyalty to the Crown and the perception of religious orthodoxy as well as personal or corporate creditworthiness. The possession of the legitimate moral authority to articulate beliefs and shape practice was as important as the defence of 'true matters of fact'.

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[12] Charles Webster, *The Great Instauration, Science, Medicine and Reform 1626-1660* (London: Duckworth, 1975).

[13] Thomas Sprat, *The History of the Royal-Society of London, for the Improving of Natural Knowledge* (London, 1667, facsimile rpt. London: Routledge and Kegan Paul, 1658).

[14] A. J. Cain, 'John Ray on the species', *Archives of Natural History (26(2)* (1999) pp. 223-231; Cain, 'Thomas Sydenham, John Ray, and some contemporaries on species,' *Archives of Natural History* 26(1) (1999), pp. 55-83. Cain, 'John Locke on Species', *Archives of Natural History* 24(3), 1997) pp. 337-360; Cain, 'John Ray on Accidents', *Archives of Natural History,* 23(3) (1996), pp. 345-353; J. Hall, 'The Classification of birds, in Aristotle and Early Modern Naturalists', *History of Science* 29 (1991) pp. 111-151 and pp. 223-243; Scott Atran, *Cognitive Foundations of Natural History: Towards an Anthropology of Science* (Cambridge: Cambridge University Press, 1989); Scott Atran, 'Origin of the Species and Genus Concepts: An Anthropological Perspective', *Journal of the History of Biology* 20(2) (1987) pp. 195-279; Mary M .Slaughter, *Universal Languages and Scientific Taxonomy in the Seventeenth Century* (Cambridge:

My story also revises the place of natural history in the received accounts of seventeenth century science. Many historians of the sciences have been comfortable with a view of the period as grounded in the physical and mathematical sciences. Especially for Restoration England, accounts of the 'new science' have privileged the establishment of experimental methods of enquiry at the Royal Society, for instance by Robert Boyle, Robert Hooke and others, or the ultimate triumph of the mixed mathematical program of Newton. There is much of value in these accounts. However, the burden of the Society's public image rested on the promotion of qualitative observational and experimental natural histories as the best and safest way to acquire new knowledge. Society apologists Thomas Sprat and Joseph Glanvill celebrated histories of nature, and the official organ of the

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Cambridge University Press, 1982); and Philip Sloane, 'John Locke, John Ray and the Problem of the Natural System', *Journal of the History of Biology* 5 (1972), pp. 1-53.

Society, the *Philosophical Transactions*, has been called Henry Oldenburg's "newsletter of natural history." In fact, natural history may well have been the "big science" of the sixteenth, seventeenth and eighteenth centuries measured in terms of the large sums spent on anatomy theatres, botanical gardens, university chairs, and private museums; even at the Royal Society, one of its earliest acquisitions was a costly collection of natural rarities, which formed the basis for their own museum. Books of natural history were also lavish and very expensive, but among the most eagerly sought within the publishing industry.[15]

I have drawn upon an analytical model for understanding the construction of scientific knowledge developed by the philosopher of science Mary Hesse.[16] Hesse showed that knowledge is not constructed from discrete and self-sufficient matters of fact, but rather consists of an organic network of concepts or laws joined together in an organized system. What is more, Hesse's model suggests that scientific knowledge is not, and cannot be, determined by the way the world is. Rather, the process of knowledge making is a uniquely human activity, undertaken by historical agents acting within a particular social organization, moral order and intellectual framework. The implications of Hesse's model are that natural history, as with other scientific knowledge construction, can be studied in terms of the social relations within a society which justifies, legitimates and is persuaded by those activities. I have also benefited from a rich repertoire of methods developed by sociologists of science to analyse the construction of knowledge systems. In particular, Harry Collins has shown how Hesse's network model of interrelated cognitive systems is linked to, exists within and interacts with social networks to produce scientifically certified knowledge.[17] Natural history, which involves experience, learning, disciplined perception, entrenchment within language systems and agreed-upon, socially-acceptable conventions about order and stability, is a fundamental exemplar of knowledge construction. The activities and concepts of natural history are processes which are embedded in prior and subsequent social action and further, are reinforced, stabilized and maintained by social relations which are themselves governed by rules and institutions. Understanding seventeenth-century natural history requires that we not only understand the cognitive relations and the practices and the protocols involved in the activity, but we also need to take into account the interests of individual actors, the community and the institutions in which natural history became entrenched.

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[15] Harold J. Cook, 'Physicians and Natural History', *Cultures of Natural History*, eds. N. Jardine, J. A. Second and E. C. Spary (Cambridge: Cambridge University Press, 1996); Cook, 'The cutting edge of a revolution? Medicine and natural history near the shores of the North Sea', *Renaissance and Revolution: Humanists, scholars, craftsmen and natural philosophers in early modern Europe*, eds. J. V. Field and Frank A .J. L. James (Cambridge: Cambridge University Press, 1993) pp. 45-72; and Cook, 'The new philosophy in the Low Countries', *The Scientific Revolution in National Context*, eds. Roy Porter and Mikulas Teich (Cambridge: Cambridge University Press, 1992), pp. 115-150.

[16] Mary Hesse, *The Structure of Scientific Inference* (London: Macmillan, 1974).

My project reevaluated the roles and practices of natural history in early modern England (1650-1700). I was not concerned with studying the history of natural history as an articulated body of theoretical knowledge. Rather, I was concerned with explaining the existence of a clearly identifiable and disciplined tradition of natural history at about 1700. At mid-century, natural history was not a single and defined scholarly activity. 'Natural history' applied to a broad array of topics, approaches and activities which were practised by a cross-section of individuals who held widely differing motivations, values and intentions for their activity. By the end of the century, there existed a community of scholars and natural philosophers who consistently identified themselves as Natural Historians and their enterprise as Natural History. They were committed to a specific scholarly tradition which they represented, they were agreed upon the relevant activities, protocols and procedures for their discipline and they were preoccupied with taxonomy, that branch of natural philosophy which delineates the natural order and relation of things. Thus, I understand natural history to have been an activity which rested on a foundation of recognized authority, was a specialized, learned craft activity, and which produced knowledge which was acceptable within the specific, localized culture of late seventeenth-century England.

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[17] H. M .Collins, *Changing Order: Replication and Induction in Scientific Practice* (Chicago and London: University of Chicago Press, 1992).

Early modern England provided an especially rich context in which to examine the history of natural history, in particular because there were several potential choices available for the ultimate shape of the discipline: the natural history enterprise of the Royal Society, the botanical project of Robert Morison and the tradition promoted and practised by John Ray. All three traditions used acceptable methodology and epistemology, and all three traditions were encouraged by individuals who appeared to possess the appropriate credentials to speak authoritatively on matters of natural history. There was no self-evidently correct, obviously true or rational basis for the cultural dominance of any one specific approach, and therefore the development of natural history into a single agreed-upon activity was highly contingent upon the individuals involved and the unique circumstances of the period.

The Royal Society for the Promotion of Natural Knowledge is, of course, important in any interpretation of early modern science in England. Founded in 1662, the membership of Royal Society represented the privileged classes within the English political nation and as such, had ambitions to become an institution whose role was that of knowledge maker and validator. The Royal Society endorsed a view of both nature and society which preserved the culturally-dominant 'aims, values and norms' within elite Restoration society, and the rhetoric of the Royal Society was specifically directed to the values and interests of the Anglican and loyalist ruling hierarchy. The Royal Society intended natural history to provide the basis for their investigations into nature and the fruits of natural history were intended to form the bedrock foundation for both theory and practice. As late as 1697, William Wotton continued to claim that "The Royal Society made it their business to set their members awork to collect a perfect history of Nature, in order to establish thereupon a body of Physick."[18] Natural history at the early Royal Society was held to be the disciplined practice of observing, analysing, measuring, dissecting, and 'vexing' nature, often using the latest techniques and instruments for those purposes. Indeed, the activity was defined so broadly as to encompass virtually all the activities of the young society. As a result, there was no single and agreed upon 'correct' approach to natural history at the Royal Society prior to 1690 and no continuing tradition was promoted. Even the Society-sponsored natural history project of Nehemiah Grew was not fruitful in terms of establishing a continuing tradition.

Another likely candidate for shaping the discipline of natural history in England was the physician Robert Morison (1620-1683). Morison, no less than the Royal Society, had positive credentials to direct the future course of the enterprise. He had enjoyed a distinguished career at the Jardin du Roi at Paris during the 1650s and returned to England at the Restoration of the monarchy in 1660 when he became a physician to Charles II and superintendent of the royal gardens at St. James. He was later appointed to a chair at Oxford University with further responsibility for the Oxford Physic Garden. In Morison's several important works on plant systematics, he consistently identified himself as the 'King's Botonographer', however there were few contemporaries who aligned themselves with the Morisonian tradition in botany.

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[18] William Wotton, *Reflections upon Ancient and Modern Learning* (London, 1694).

The ultimately successful tradition of natural history was centred on the natural philosopher John Ray (1627-1795) and Ray's career has been especially important in charting the development of the discipline of natural history. An examination of Ray's career has allowed me to assess the extent to which Ray both stood within an established tradition and how he was ultimately responsible for the definition of what became known as Natural History in the 1690s. Ray was involved in all aspects the enterprise, and his works included histories of plants, animals, fish, birds, insects, and geology as well as several important works of natural theology. Ray also played a leadership role in the formation of a natural history community which was composed of independent gentlemen, clergymen, physicians and fellows of the Royal Society. At first glance, however, Ray is an unlikely candidate for the role of founding father of natural history: he was not a physician, as many of those who studied plants were, nor was he a wealthy 'gentleman virtuoso' of the Royal society. Rather, Ray was an ordained Anglican priest, and "sometimes" Fellow of Trinity College Cambridge who had severed his institutional connection with the University in 1662 and who was financially supported throughout his career by the generosity of his patron Francis Willughby. True, Ray had been elected Fellow of the Royal Society in 1667, but he played only a small active role in its affairs. The focus and orientation of Ray's natural history project was also very different from that of the early Royal Society.

Several deliberate strategies played an important role in the cultural dominance of Raian natural history. Over a period of forty years, Ray developed and encouraged a community of competent observers, many of whom continued to promote disciplined natural history. Ray established a number of practices, protocols and procedures which became incorporated into many natural historical activities, and which other practitioners needed to acquire for acceptance within an expert community of accurate observers and reporters. He developed a technical vocabulary to describe the physical characteristics of the parts of plants, devised a distinctive botanical nomenclature, and established a set of standard observational practices. Many of Ray's natural history works, in particular his important three-volume *Historia Plantarum* (1686, 1688 and 1704), became standard botanical texts during the eighteenth century. Ray also established biological classification as "a science of the senses" rather than as an exercise in philosophical ordering; he repeatedly rejected Aristotelian qualities and essences, if indeed there were such, as they could not be known by experience. Finally, Ray also became an extremely successful popular author during the 1690s with his two well known works of natural theology, the frequently reprinted *Wisdom of God Manifested in the Works of Creation* (1691) and the *Miscellaneous Discourses* (1692). Ray's *Wisdom of God* promoted a deliberate socio-political message: its contents simultaneously promoted an orderly, unchanging, harmonious nature and an orderly, stable and consensual society. Natural theology had the ultimate effect of making the study of natural history an acceptable and pious practice not merely for Anglican gentlemen but also for Anglican divines. Its rhetoric was also used to justify the practical application of economic natural history, especially botany, in imperial Britain.

My research has been important for understanding the disciplinary transformation of natural history in the early modern period, but it also contributes to a growing body of literature which is revising the place of natural history in the received accounts of early modern science. I have examined how natural history was transformed into a legitimate scholarly activity by 1700, practised by a disciplined and competent community. Natural history was a serious cooperative venture by a dedicated community of investigators, who pursued a set of deliberate and self-conscious activities and who had as their central aim the first hand observation of God's creation and its systematic organization. The ultimate object of my analysis was to show how a community of natural historians organized themselves, agreed upon the nature of their enterprise, validated their knowledge and constructed a public identity of the Natural Historian.

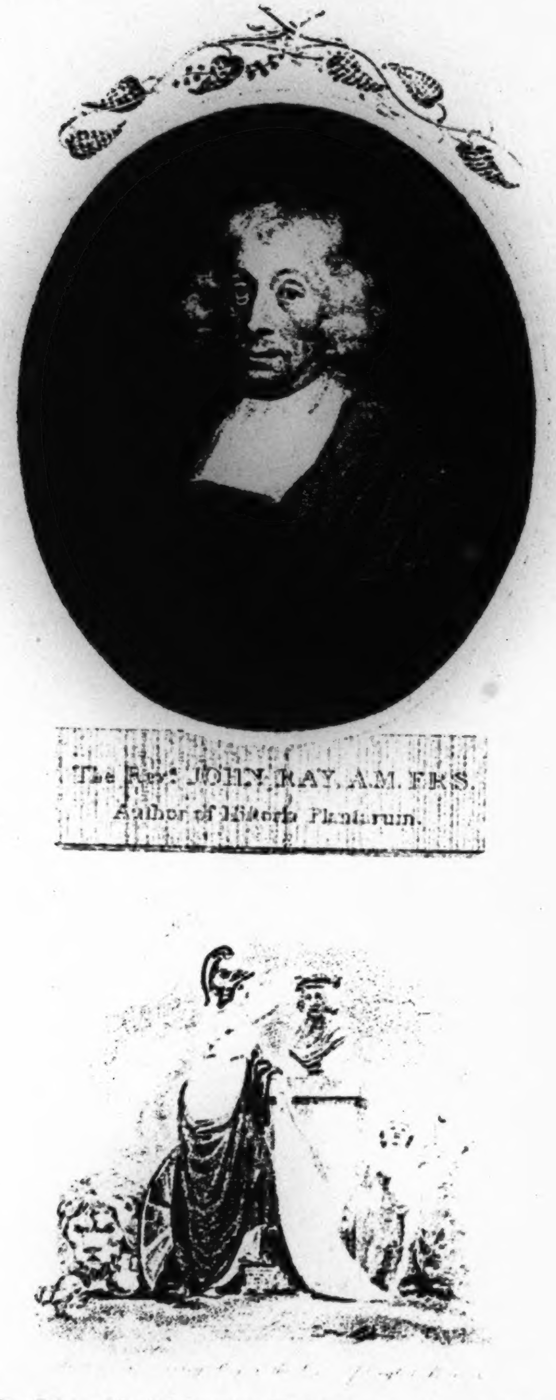
The Revd. JOHN RAY, A.M. F.R.S.
Author of Historia Plantarum.

Fig. 1. John Ray. Prince of English Botanists. The Library. Royal Botanic Gardens. Kew.

CHAPTER 1

"Never leaving the Church in these times of giddiness and distraction"[1] The Shaping of John Ray and His Contemporaries 1642-1660

The period of reconstruction after 1660 was especially critical for the redefinition of social, political and religious attitudes in England. Specific issues concerning the reconstitution of acceptable knowledge became crucial, in particular who had the legitimate moral authority to articulate beliefs and shape practice. More was at stake than merely to be seen to be defending a true or objective set of beliefs and practices; rather, legitimacy also rested on the creditworthiness of the agent, socially, politically, and in terms of religious orthodoxy.[2] Concern with natural history and natural philosophy was not uniquely limited to any one individual or group of individuals and therefore the development of what constituted proper natural history was highly contingent. To answer historical questions about the content and the practices of natural history after 1660, the political and religious assumptions which shaped its study and became entrenched in the disciplinary structure of natural history merit examination. In particular, the political and religious loyalties forged during the years 1642-1660 and which were manifest in contemporary culture are crucial for our understanding of the subsequent career of natural history, and especially with respect to the views of the natural philosopher John Ray FRS (1627-1705).

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[1] John Ray, *Memorials of John* Ray, ed. Edwin Lankester, (London: Ray Society, 1848), p. 37.

[2] For a discussion of 'social credit' see especially Craig Muldrew, *The Economy of Obligation: The Culture of Credit and Social Relations in Early Modern England* London: Macmillan, 1998) and Steven Shapin, *A Social History of Truth: Civility and Science in Seventeenth-Century England* (Chicago: University of Chicago Press, 1994). For a discussion of competing claims for authority based on reputation, see J. A. I. Champion, *The Pillars of Priestcraft Shaken: The Church of England and its Enemies 1660-1730* (Cambridge: Cambridge University Press, 1992).

Ray was known to his contemporaries as the "great Mr. Ray"; subsequent generations knew him as the founding father of English natural history, "the English Aristotle," the "British Linnaeus" and the "Prince of Botanists." During the politically charged decades of 1660-1700, Ray was at the centre of a community of natural historians which defined the activities, standardized procedures, validated experience and established competence in its practitioners. His legacy was to build an enduring foundation for the discipline of natural history as a legitimate enterprise for structuring and interpreting nature. Raian natural theology also became stabilized as the practical application of natural history to understand God and his creations in the world. Thus, the matter of Ray's religious identity has a bearing on how historians are able to explain his later preeminence as a spokesman for "rational piety, sound philosophy, and solid instruction."[3]

The Cambridge naturalist left no explicit evidence of either his religious or political views in the period 1642-1660, and there have been no detailed studies of this aspect of Ray's life. To late seventeenth-century contemporaries, there was little doubt about Ray's attachment to the Church of England. Ray enjoyed the support of John Tillotson Archbishop of Canterbury (1690-1694), a contemporary of Ray's at Cambridge and an acquaintance of long standing, to whom Ray dedicated his second work on natural theology, the *Miscellaneous Discourses* (London, 1692). Many of Ray's friends and collaborators were also Anglican clergymen, several of whom subsequently became bishops, including John Wilkins,[4] Richard Kidder,[5] and especially the botanically minded Henry Compton, who was to organize a monument at Ray's tomb.[6] Finally, in 1718 Ray's philosophical letters were published, including a testimony of his final words which professed "that as I have lived, so I desire, and, by the Grace of God, resolve to dye in the Communion of the Catholick Church of Christ, and a true tho' unworthy Son of the

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[3] Sir James E. Smith, *Ree's Cyclopedia* (first American Edition 1812) sv Ray . James Edward Smith (1759-1828) was eminently qualified to comment on Ray: the first meeting of the Linnean Society was held in his home in Great Marlborough Street in April 1788, at which he was elected the first president; *DNB*, vol. 54 (1898), pp. 61-64 .

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[4] Wilkins, Master of Trinity (1659-60) and later Canon of St. Paul's (1668) and Bishop of Chester (1668-72), became one of the founders of the Royal Society and its first secretary, sponsored Ray's membership in the Society in 1667 and was acknowledged by Ray as a "friend and patron." During the Civil War and Interregnum, Wilkins had avoided extreme political alignments and while Warden of Wadham College Oxford, he turned the college into a haven for those with Anglican and Royalist sympathies, a position for which he was routinely criticized by the 'stricter puritans'. Described as a 'moderate Anglican', Wilkins made himself unpopular with Anglican high churchmen after the Restoration for his stance on moderation and toleration in religious affairs. John Hedley Brooke, *Science and Religion: Some Historical Perspectives* (Cambridge, etc.: Cambridge University Press, 1991), pp. 107-108; Tim Harris, *London Crowds in the Age of Charles I: Propaganda and politics from the Restoration until the exclusion crisis* (Cambridge: Cambridge University Press, 1987), p. 86; Barbara Shapiro, *John Wilkins 1614-1672: An Intellectual Biography* (Berkeley: University of California Press, 1969). In the Preface to the *Synopsis Methodica Stirpium Britannicarum* (1690), Ray acknowledged '*Reverendiss. Praesule D. Joanne Wilkins, Episcopo tum Cestriensi Amico & Patrono*", sig. a.

[5] Kidder, who Ray described as "my worthy friend," was a client of the Royalist earl of Essex and later of Daniel Finch, earl of Nottingham. Kidder later became Bishop of Bath and Wells (1691) and the second Boyle Lecturer (1693). *DNB*, Vol. 12, pp. 96-98; Richard Kidder, 'Autobiography', *Lives of the Bishops of Bath and Wells*, ed. S. H. Cassan (London 1829-30), pp. 227-264; *Biographica Britannica*, vol. 4 (London, 1747-66) pp. 2837-2839; John Ray, *A Collection of English Proverbs*, 2nd edn (London, 1678), sig. A3v; Ray, *A Collection of Unusual Words*, 2nd edn (London 1691), sig. A5v.

[6] Compton, consecutively Bishop of Oxford (1674) and Bishop of London (1675-1713), became active at the court of Charles II, responsible for the education of the Duke of York's daughters (the future Queens Mary and Anne) and was a member of Anne's Privy Council when he organized the monument at Ray's tomb. Compton, who also spent several months in Ray's company while at Rome in 1664, was the son of Spencer Compton, the Royalist earl of Northampton, killed at the battle of Hopton Heath in 1643. *DNB*, vol. 4, pp. 899-903; *Biographica Britannica*, Vol. 3, pp. 1425-1532; John Ray, *Observations Topographical, Moral and Physiological; made in a Journey through part of the Low-Countries, Germany, Italy and France* (London 1673).

Church by law establish'd in this kingdom."[7]

Many modern historians, however, have placed Ray within the Puritan tradition of early modern England, a designation which carried both religious and political implications. In 1936 Robert Merton, endeavouring to understand the increased tempo of scientific activity in the seventeenth century, argued that the Puritan ethos was one of the contributing factors in that process, and he included a Puritanized Ray as one of the progenitors of the Scientific Revolution. This interpretation has been followed by such eminent historians as Christopher Hill and Charles Webster, and indeed, Ray's common fame as a Puritan remains part of our framework for understanding his place in the seventeenth century.[8] The persistence and attractiveness of the 'Puritan interpretation of history' as a contributor to modernity, in conjunction with a tradition to ennoble nonconformity, were also irresistible to Ray's principal biographer, Charles Raven.[9]

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[7] *DNB*, vol. 5 pp. 842-843; *Biographica Britannica,* Vol. 3, pp. 1649-1643; Rev. Mr. Pyke, Rector of Black Notley, *The Philosophical Letters of John Ray*, ed. W. F. Derham (London, 1718), pp. 374-375; Pyke's letter was also reprinted in full under Ray's entry in the *Biographica Britannia*, vol. 7, pp. 3499.

[8] Jeremy Gregory, 'Christianity and Culture: the Arts and the Sciences in England 1660-1800', *Culture and Society in Britain 1660-1800,* ed. Jeremy Black (Manchester and New York: Manchester University Press, 1997), pp. 102-123; M. E. Lazenby, *The Historia Plantarum Generalis of John Ray*, Unpublished PhD Dissertation (The University of Newcastle upon Tyne, 1995); Jo Gladstone, 'New World of English Words': John Ray, RFS, the Dialect Protagonist, in the Context of his Times (1658-1691), *Language, Self, and Society: A Social History of Language,* eds. Peter Burke and Roy Porter (Cambridge: Polity Press, 1991), pp. 115-153; Christopher Hill, *The Experience of Defeat: Milton and some Contemporaries* (London: Faber and Faber, 1984), p. 20; Charles Webster, *The Great Instauration: Science, Medicine and Reform 1626-1660* (London: Duckworth 1975), pp. 84, 150-3; Robert K. Merton,'Science Technology and Society in Seventeenth Century England', *Osiris: Studies in the History and Philosophy of Science, and on the History of Learning and Culture*, vol. IV, part 2 (1938, rpt. New York: Howard Fertig, 1970), pp. 80-111. Barbara Shapiro appears to be the only recent historian to situate Ray as an Anglican and Royalist, *John Wilkins*, p. 143.

[9] For accounts of the 'heroic fortitude' of post-Restoration Puritans, see for instance Christopher Hill, *The Experience of Defeat*, and Gerald R. Cragg, *Puritanism in the Period of the Great Persecution 1660-1688* (Cambridge: Cambridge University Press, 1957).

Raven was cautiously ambiguous in discussing Ray's relationship with the Anglican Church. Simultaneously admitting that Ray was "never a Presbyterian or an Independent," Raven chose to imply that Ray was nevertheless "temperamentally of the Puritans," that "Ray had enough of the Puritan in him," that "he had a large sympathy with Puritanism," and that "he was always something of a Puritan."[10] The historical judgement of Ray's Puritanism, if correct, should have disabled Ray from a significant role in shaping Restoration culture. Therefore, Ray's personal success in stabilizing the discipline and securing legitimacy for the natural history enterprise requires that the issue of Ray's religious affiliation be reexamined. This chapter is an attempt to reconstruct our understanding of Ray's background and allegiances by an analysis of his early Essex environment and those with whom he chose to associate at Cambridge.[11] On this basis there is little evidence to situate Ray within Puritan framework, and much evidence to suggest a strong commitment to Anglican and loyalist principles.

Religion and Politics

There are several reasons why the matter of religion concerns historians of science. Religion within the Judaeo-Christian context involves an agreed upon system of theological beliefs as well as the rituals and practices voluntarily observed by self-identified groups to profess their faith in God and his revealed word. In the seventeenth century, religion was vitally concerned with acquiring knowledge of the God who created the world, governs its natural course of events and controls its future destiny. Religion was involved with knowing God not only through his revelation but also through his creations, that is, the particular study of nature in all its wonder and complexity as God created it. The specific undertaking to know God through the study of the created world was understood by those engaged in the activity as natural philosophy.

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[10] Charles Raven, *John Ray: Naturalist. His Life and his Works* (Cambridge: Cambridge University Press, 1942, 2nd edn 1950 rpt. 1987), pp. 36, 58, 60, 65.

[11] Conrad Russell, for instance, claims that the fullest possible knowledge of an individual's background tells us nothing about civil war partisanship "if it leaves out the preaching available in their home parish;" see Russell, *Causes of the English Civil War,* pp. 2-3. For a rationale on this method for establishing links between action and context, see Steven Shapin and Arnold Thackray, 'Prosopography as a Research tool in the History of Science: The British Scientific Community 1700-1900, *History of Science* 12 (1974), pp. 1-28; for a case study see Lake, ' The Calvinist Conformity of Robert Sanderson'.

Natural philosophy encompassed an array of ambitions which included the exploration of God's creation and admiration of His wisdom and foresight, attempts to discover God's laws by uncovering regularities in nature, or the endeavour to understand the mind of God, His intentions, His purposes and His messages to mankind. Natural philosophy was an individual's preoccupation with matters of God and of man's relationship to Him. Natural philosophers studied nature in a variety of ways and for a number of reasons, and the search for demonstrative knowledge through experimental practices, mathematics or through the precise descriptions of natural history reflected individual curiosities and expertise. Differing religious commitments also had different concepts of God, his nature and his attributes, and therefore also had different ways to study the world that God created.[12]

Religion was also the foremost issue in seventeenth-century England, not merely because of disagreements about doctrine or practice, but because allegiance to the established church was also seen to be an indication of loyalty to the crown.[13] Since the Elizabethan Act of Supremacy (1559) restored royal control over the Church, the episcopal government of the Church of England underpinned monarchical authority in the state: in Elizabethan, Jacobean and Caroline England, bishops were appointed precisely because they supported royal policy.[14] Further, religion was both a significant contributor to the politics of the civil war and an important dynamic within it.[15] The policy of Charles I to enforce uniformity of religious practice on his kingdoms was resisted by 'the hotter sort' of Protestants, and religious differences often translated into political factions opposed to the Caroline state order. The continued thrust for godly reformation and its associated challenge to Episcopal authority was also in direct conflict with the ecclesiastical policies of the Crown.[16]

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[12] For a discussion of the role of natural philosophy, see especially Roger French and Andrew Cunningham, *Before Science: The Invention of the Friars' Natural Philosophy* (Aldershot, Hants.: Scholar Press, 1996); Andrew Cunningham, 'How the *Principia* Got its Name: or, taking Natural Philosophy Seriously', *History of Science* 29 (1991), pp. 377-392; and Cunningham,' Getting the Game Right: some plain words on the Identity and Invention of Science', *Studies in the History and Philosophy of Science* 19(3) (1988), pp. 265-388.

Historians have attempted to understand the Protestant reforming movement of seventeenth-century England and define the attributes of those individuals who have come to be known as Puritans. In a strictly religious sense, 'Puritan' has been broadly generalized to pertain to the "hotter sort" of Protestants who were more zealous in their pursuit of the religious experience; Patrick Collinson's description of these godly

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[13] Patrick Collinson, 'Monarchy and Prelacy', *The Religion of the Protestants: The Church in English Society 1559-1625*, The Ford Lectures (Oxford: Clarendon Press, 1982), pp. 1-38.

[14] Fincham and Lake, 'Ecclesiastical policies', pp. 23-59.

[15] John Morrill, *The Nature of the English Revolution* (London and New York: Longmans, 1993), pp. 34-67; Morrill calls the English Civil War the last "war of Religion".

[16] Russell, 'Religious Unity in three Kingdoms and in One: Religion, Politics and Charles I, 1625-1642', *Causes of the Civil War*, pp. 109-130; Fincham and Lake, 'Ecclesiastical Policies', pp. 36-47.

Protestants as the "virtuoso minority whose practice of religion was prodigious" has gained widespread currency.[17] One of the distinctive aspects of Puritan culture was a tendency to separate from the 'reprobate' and voluntarily join together into communities of similar outlook and discipline. With respect to a specific set of religious beliefs, practices or values, however, historians have been unable to isolate with certainty those that identify the Puritan. The seventeenth-century Church of England had encouraged a wide spectrum of beliefs, with shades of Calvinism from extreme to moderate and a similar array of beliefs known as Arminianism. It is also difficult to find unequivocal distinctions between the Calvinist and Arminian positions on ceremonies, liturgy or the 'fabric of the church'.[18] Historians now accept that during the middle decades of the seventeenth century, contemporaries used the term "puritan" to designate a political force representing Calvinist antagonism to the policies of James I and Charles I.[19] Recognizing this extra-religious dimension provides historians with a better understanding of the Puritan ethos as an "ideology of opposition."[20] Thus, during the Civil Wars, the Puritan attack on the Established Church was sustained and determined, but was also accompanied by a variety of opposition activities not directly connected with either religion or the Church.

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[17] Patrick Collinson, *The Birthpangs of Protestant England: Religion and Cultural Change in the Sixteenth and Seventeenth Centuries* (New York: St. Martin's Press, 1988), p. 21.

[18] Kevin Sharpe, *The Personal Rule of Charles I* (New Haven and London: Yale University Press, 1992), pp. 186-88 and 317-322; Peter Lake, 'Serving God and the Times: The Calvinist Conformity of Robert Sanderson', *Journal of British Studies* 27 (April 1988), pp. 81-116.

[19] See especially Nicholas Tyacke, *The Anti-Calvinists: The Rise of English Arminianism 1590-1650* (Oxford: Clarendon Press, 1987); Hugh Trevor-Roper, 'Laudianism and Political Power', *Catholics, Anglicans and Puritans* (London: Fontana Press, 1989), pp. 40-119; Kenneth Fincham and Peter Lake, 'The Ecclesiastical Policies of James I and Charles I', *The Early Stuart Church, 1603-1642*, ed. Kenneth Fincham (Stanford: Stanford University Press, 1993), pp. 23-50; and Morrill, *The Nature of the English Revolution.*

[20] Robert Ashton, *The English Civil War: Conservatism and Revolution, 1603-1649*, 2nd edn (London: Weidenfeld and Nicholson, 1989), pp. 97-125.

The middle decades of the seventeenth century were among the most highly politicized periods of English history, and partisan politics dominates any interpretation of the sequence of events which culminated in the civil war and interregnum. The individual allegiances formed during the civil wars, that is, a positive commitment either for the King or for Parliament or, alternately, a determined or reluctant neutrality, often resulted in long term commitment, significant financial loss and personal hardship, and defined both the inventors and the consumers of cultural products. It is now widely accepted that the civil war was not a clash of two clearly differentiated social groups or classes, and that there was no unanimous consensus either among a defined group, or within a defined area, although clearly there were social tensions and pressing local issues. Neither was the civil war a steady crescendo of political struggles between the "government" and a self-conscious "opposition"; rather the conflict was nearer to being a struggle between Charles I and his own government.[21] The civil war was not the inevitable outcome of long-standing grievances driven by democratic ideology or constitutional principles, but it was an unselfconscious, uncertain and contingent event.[22] There is no *absolute* division of personal allegiance or religious belief despite recent attempts to label the events as a contest between Arminians and Calvinists, Anglicans and Puritans or Presbyterians and Anti-Calvinists.[23] Religious preference, however, is an important indicator of civil war political allegiance: political preference tended to divide those with a strong commitment to godly reformation and Parliamentarian ideals from those with a concomitant attachment to the Established Church and King.[24]

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[21] Conrad Russell, *The Causes of the English Civil War* (Oxford: Clarendon Press, 1990), pp. 2-6.

[22] Geoffrey R. Elton, 'A High Road to Civil War?' *Studies in Tudor and Stuart Politics and Government II* (Cambridge: Cambridge University Press, 1974), pp. 167-181.

[23] Fincham and Lake, 'The Ecclesiastical Policies of James I and Charles I', pp. 23-50.

The Civil Wars and The County of Essex

There were three basic choices in the Civil Wars: to be neutral, to support the parliamentary regime or to profess loyalty to the crown. There has been no examination of civil war neutrality in John Ray's home county of Essex, although a local study of nearby Sussex suggests that neutralism in general may be categorized in terms of self-interest, apathy and "bewildered" moderation. Neutrality was often a way for gentlemen to secure their estates and ease their consciences, and became a refuge for gentry in sympathy with the court, especially in parliamentary areas. Many gentlemen were politically and religiously disinclined to engage in the conflict, while many others were reluctantly drawn to neutralism as a way of avoiding a commitment on either, or both, sides.[25] Neutrality, then, was a popular choice in the difficult circumstances of the civil wars, and many gentlemen remained uncommitted to either of the contending forces. Determinedly neutral landowners, however, left few records of their activities in the 1640s, and thus their identification is problematic.

The historical record for supporters of Parliament and the Crown is more secure. In Essex, the Puritan minority may have approached 50% of the population prior to the

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[24] Russell, *Causes of the Civil War*, pp. 20-22; Morrill, *The Nature of the English Revolution*, pp. 38-39.

[25] Anthony Fletcher, *A Country Community in Peace and War: Sussex 1600-1660* (London and New York: Longmans, 1975), pp. 284-289.

Civil Wars and Essex was home to a number of Parliamentarian leaders, including: Robert Rich earl of Warwick[26] and commander of the forces of the Eastern Association; Bulstrode Whitelock,[27] Chairman of the Committee for prosecuting the earl of Stafford, and in 1656 Speaker for the House of Commons; and, Harbottle Grimstone (*pater et filius*).[28] By the 1630s about half the clergy in Essex were broadly Puritan, and traditionally the area has been represented as under the influence of the godly magistery of leading landowning families.[29] As part of the Eastern Association of the Parliamentary Forces, Essex also was fortunate to escape much of the violence of the first Civil War.[30]

There were few Puritans in Ray's immediate neighbourhood surrounding Black

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[26] Cromwell's youngest daughter Frances, married Robert Rich, heir to Robert, earl of Warwick, but Robert *filius* predeceased the earl; William Addison, *Essex Worthies: A biographical companion to the County* (London and Chichester: Phillimore, 1983), p. 156.

[27] Sir Bulstrode Whitelock of Blunts, Witham (1605-76) was chairman of the committee for prosecuting the earl of Strafford. In 1653 he was sent as ambassador to Sweden. Three years later he became Speaker of the House of Commons, and in 1658 a member of Cromwell's House of Lords. The following year he was made President of the Council of State and Keeper of the Great Seal; Addison, *Essex Worthies*, p. 200.

[28] Sir Harbottle Grimstone the Elder (d. 1647/48) was a prominent Puritan magistrate who gained a reputation in the county for hunting down and punishing recusants. Harbottle Grimstone *filius* (1603-1685) was Recorder at Colchester and represented that borough in the Long Parliament. In August, 1642 he committed Colchester resident and royalist Sir John Lucas and his lady to prison as traitors. He also presided over the committee appointed to inquire into the escape of Charles 1 from Hampton Court in 1647. Grimstone played a prominent part in unsuccessful negotiations with Charles in the Isle of Wight, as a result of which he was committed to the Tower, where he remained until the end of Charles's trial and execution. In June 1648 his house Bradfield Hall was occupied in his absence by the Earl of Warwick who plundered it and turned out his wife. Grimstone was purged by Col. Pride in December 1649 and remained under suspicion by the Parliamentary governors until after Cromwell's death. William Addison, *Essex Worthies*, pp. 91-92, *DNB*, vol.8, pp. 700-702; William White, *History, Gazetteer, and Directory of the County of Essex* (Sheffield, 1848), p.77.

[29] Keith Wrightson and David Levine, *Poverty and Piety in an English Village, Terling, 1525-1700* (Oxford: Clarendon Press, 1979, rpt. 1995), esp. pp. 164-189.

[30] Wrightson and Levine, *Poverty and Piety*, pp. 154-162, D. R. Hershberg, 'The Government and Church patronage in England 1660-1760', *Journal of British Studies* 20 (1980), pp. 109-139; B. Lyndon, "Essex and the King's Cause in 1648", *Historical Journal* 29(1) (1986), pp. 17-39; I. M. Green , 'The persecution of "scandalous" and "malignant" parish clergy during the English Civil War', *English Historical Review* (1979), pp. 507-532.

Notley. The Rev. Samuel Collins was Master of the Braintree school which Ray attended and is reported to have been instrumental in obtaining a scholarship for Ray at Catherine Hall, Cambridge. Collins, also Vicar of Braintree and a client of the Earl of Warwick, is described as friendly with "both Laud and the Puritan ministers" and escaped sequestration during the civil wars. Collins refused to be a signatory to the Essex Testimony (1648), a manifesto of orthodox Presbyterianism strongly approving the work of the Westminster Assembly. His signature is present on the Essex Watchmen's Watchword (1649), a Presbyterian document which condemned the execution of the King.[31] The best evidence of Collin's sentiments is his refusal to subscribe to the Oath of Engagement in 1650, a declaration of loyalty to the Commonwealth government for which he was financially penalized. Collins then, may best be seen as a moderate Puritan, although he was not Ray's tutor at the Braintree school and his direct influence on Ray is unknown.

Substantial evidence exists for the presence of a rival royalist and Anglican faction within Essex society during the 1640s, and this partisan division endured throughout the decade. Many individuals and families subjected themselves to the pressures of conscience and the dilemma of choice by a declaration of loyalty to Charles I. This was both a personally expensive and potentially dangerous commitment: heavy fines and sequestrations were imposed on Royalist gentry and approximately 40% of the clergy in Essex suffered deprivation of their livings for their Anglican sympathies.[32] By 1648, only one parish in John Ray's local district in northern Essex, the Hundred of Witham, had been approved as a Presbyterian classis, the smallest return of any district in the county.[33] Furthermore, north Essex was the site of major military campaigns during the Second Civil War of 1648, and some of the most bitter contests of the conflict occurred in the area.[34]

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[31] Raven, *John Ray, Naturalist*, pp. 16-19, Harold Smith, *The Ecclesiastical History of Essex under the Long Parliament and Commonwealth* (Colchester: Benham and Co., 1949), pp. 30-35, 148, 169, 302-304, 409.

[32] *Ibid.*

In Ray's village of Black Notley, there had been Puritan activity in the late sixteenth century, especially on the maternal side of the Bedell family, but little evidence of continuing concern in the seventeenth.[35] On the other hand, there were several prominent Anglicans who had direct connection with the civil war conflict on behalf of the crown. The manor of Black Notley was owned from 1634 by Thomas Keightly (1596-1662), who also appointed the Rector of the parish.[36] Keightly was a cousin of the well-known Royalist John Evelyn and spent at least part of the civil war years in exile among Stuart loyalists in France.[37] Joseph Plume, Keightly's nominee, assumed the living of Black

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[33] *Division of the County of Essex into Several Classis, with the names of the Ministers and others fit to be of each Classis, certified by the standing Committee of that County, and approved by the Committee of Lords and Commons appointed by ordinance of both Houses of Parliament for the Judging of Scandall and approving the classis in the several Counties of England* (London, 1648).

[34] Alfred Kingston, *East Anglia and the Great Civil War* (London: Elliott Stock 1897), pp. 252-289; B. Lyndon, 'Essex and the King's Cause in 1649', pp. 17-39; B. P. Lyndon, 'The Parliament's Army in Essex, 1648. A military community's association with county society during the Second Civil War', *Journal of the Society for Army Historical Research* 59 (1981), pp. 229-242.

[35] William Bedell, originally of Black Notley (1570/71-1642) was appointed to the Irish Bishoprics of Kilmore and Ardagh in 1629, and had some sympathy for the Covenanting party in Scotland. There is also evidence of conflict with Lord Strafford, Thomas Wentworth, Lord Lieutenant of Ireland. *DNB*, vol. 2, pp. 105-108; White, *History of Essex*, p. 176.

[36] Morant, *History of Essex*, p. 124.

[37] John Evelyn, *The Diary of John Evelyn*, ed. E. S. DeBeer, Vol. II (Oxford: Clarendon Press, 1955), p. 5 and fn. 4, p. 80 and fn. 3, p. 175. Keightly's mother Rose was the half-sister of Sir Thomas Evelyn of Long Ditton and godmother to John Evelyn, the diarist. By 1651 Keightly had converted to Catholicism despite efforts by Evelyn who unsuccessfully recruited John Cosin, former Vice-Chancellor of Cambridge, to reclaim Keightly for the Church of England; see Evelyn's Diary, Vol. III, pp. 35-36 and 633-4 (June 21 or 22 and June

Notley in 1638 and his name appears in Parliament's list of scandalous and malignant priests. Plume was charged with bowing at the name of Jesus and presenting the churchwardens for not doing so, and this may well indicate a discontented rival group within the Parish who objected to Plume's cure.[38] What is more important, Plume identified his own political credentials by "being absent with the royal army," which virtually ensured his sequestration in 1642. The manor of Plumtrees, Black Notley, was owned by the antiquarian Richard Symmonds (1617-1692) who was a cursitor of the chancery court and committed to prison in 1642-3 for loyalty to the King. He escaped and joined the royalists' army, becoming a member of the troop of horse which formed the king's lifeguards and accompanying Charles in most of his movements for about two years. Symmonds compounded for his estates, and in 1655 was implicated in an abortive plot to restore the monarchy.[39] Symmonds' brother Edward (d. 1649), the rector at nearby Rayne, Essex (1630-1642), was a client of the royalist leader Sir Arthur Capel of Hadham (1610-1649). Like Plume, Symmonds was referred to the Committee for Scandalous Ministers and ejected from his living. Edward also became a Chaplain in the army and wrote a number of royalist works, including the *Vindication of Prince Charles* (London, 1647). Symmonds was also associated with the publication of the *Eikon Basilike* (London 1649, presented as the prayers and meditations of Charles I during his imprisonment) possibly due to his friendship with John Gauden, Dean of Bocking near

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27 or 28 June 1651).

[38] Green, 'The persecution of "scandalous" and "malignant" parish clergy', pp. 507-31.

[39] Morant, *History of Essex*, Vol , I, p. xxv, Vol II, pp. 302-303; *DNB*, vol. 19, pp. 277-278. *Calendar of State Papers* (Domestic Series) 1655, p. 367.

Braintree, the purported author of the *Eikon.*[40] In nearby White Notley, the clergyman was George Barry, an ejected fellow of Trinity College who nevertheless retained his clerical living. [41] Finally, in Cressing, Henry Smith *alias* Nevil, a prominent Essex landowner, paid composition fines of £ 5000 to Parliament for his loyalty to the Crown. While there is no definitive evidence linking Ray to any of these individuals during the Civil War years, their presence indicates active support for both the crown and the church in the vicinity of Black Notley.

In Essex as a whole, the pattern of Anglican clergymen ejected during the civil war varies proportionately in different areas. In areas where patronage was largely in the hands of influential Puritans like the Earl of Warwick, only a few clergy were sequestered.[42] In contrast, the incidence of ejections is significant where patronage rested with Royalist gentry or the church. For instance the living at Faulkborne, about four miles south of Black Notley, was in the gift of the Bullock family; their appointee Edward Strutt was ejected in 1644 for speaking against the arbitrary government of Parliament and discouraging his parishioners from taking the Covenant, the oath of loyalty to Parliament.[43] Edward Bullock, owner of Faulkborne Hall, became John Ray's patron in the 1670s. In addition, my analysis of the Hundreds of Witham and Hinkley, where Black Notley and Braintree respectively are located in northern Essex, shows a large number of declared royalists, and a correspondingly large number of ejected clergy, (See Map I and Appendix). If we may take this incidence of overt Royalist and Anglican sentiment as indication of civil war loyalties, it is possible to conclude that Ray's immediate neighbourhood had a tendency to declare for the crown rather than Parliament during the 1640s.

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[40] The *Eikon Basilike: The Portraiture of his Sacred Majesty in His Solitude and Sufferings* (London, 1649), presented Charles I as a royal martyr and may have appeared in as many as 40 editions during the Interregnum. G. Matthews, *Walker Revised, being a revision of John Walker's Suffering of the Clergy during the Grand Rebellion 1642-60* (Oxford: Clarendon Press, 1948 rpt. 1988), pp. 164-165; Smith, *Ecclesiastical History*, p. 228; and Morant, *History of Essex*, pp. 302-303, 305.

[41] Matthews, *Walker Revised*, p. 41.

[42] Smith, *Ecclesiastical History*, p. 124.

[43] Matthews, *Walker Revised*, p. 164; Morant, *History of Essex*, p. 117; John Ray, *Stirpium Europaearum extra Britannias nascentium sylloge* (London 1694) was dedicated to his friend Edward Bullock; in 1694 Edward Bullock *filius* represented Essex as the member of Parliament.

At the restoration, Ray's neighbourhood quickly reasserted its Anglican character, including the restoration of Plume as Rector of St. Peter and Paul in Black Notley, where he continued to serve the parish until his death in 1686.[44] The presentation in 1663 of Black Notley's interim minister, Edward Sparhawke, for preaching at nearby Cressing without reading the Prayer Book also suggests the presence of anti-Puritan sentiment in the immediate area. The fact that Sparhawke's audience on this occasion included individuals from seven or eight parishes also suggests that the opposition was widespread and well organized.[45] This of course is not to claim that the neighbourhood was in complete accord on religious matters. Ray's friend Richard Kidder, Rector at nearby Rayne (1664-74), reported that some of his parishioners were "very censorious and given to separation, and great inveighers against the innocent rites and ceremonies of the Church."[46] However, there is little evidence of sustained Puritan activity in the immediate vicinity of Ray's hamlet during these years.

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[44] John White, *The first century of Scandalous, Malignant Priests, made and admitted into the Benefices by the Prelates, in whose hands the Ordination of Ministers and government of the Church hath been* (London, 1643). Plume was No. 33. There were also allegations against him of bad moral character, but such charges have not been generally accepted; see Smith, *Ecclesiastical History*, pp. 111, 119. Raven's account of the case against Plume "would seem to be that he was not a puritan, was on friendly terms with his flock, and had a tiffle with his wardens over his habit of bowing in the creed." Raven, *John Ray, Naturalist*, p. 13.

[45] A. G. Matthews, *Calamy Revised: being a revision of Edmund Calamy's Account of the Ministers and Others Ejected and Silenced, 1660-2* (Oxford: Clarendon Press, 1934, rpt. 1988), pp. 453-454.

Cambridge University

Many in the university community at Cambridge remained loyal to Charles I and some colleges, including Trinity, sent their college plate to the King even prior to the commencement of hostilities in August 1642.[47] The university also formally elected, as a body, to refuse financial support for the Parliamentary regime. In March 30, 1643,

> the Vice-Chancellor and heads of houses solemnly assembled in the consistory, were demanded to contribute to the parliament, so to redeem their forwardness in supplying the King. Which performed by them, would (notwithstanding their former crooked carriage in the cause) bolster them upright in the Parliament's esteem. But they persisted in the negative, that such contributing was against true religion and a good conscience: for which, some of them afterwards imprisoned in St. John's College.[48]

The universities, Cambridge as well as Oxford, had three ambitions in the seventeenth century: to provide polite education for the landed gentry; to educate professional doctors and lawyers; but especially to graduate a learned ministry for the Church. Given the function of the Church and its ministers as extensions of secular authority, control over what constituted the proper education and the proper knowledge for future church clergy was crucial. However, a religious consensus did not exist at Cambridge and the complexion of individual colleges exhibited the spectrum of religious opinion found broadly in seventeenth-century England. Cambridge was home to Emmanuel College, the premier seminary for Calvinist principles and reformist ideals, as well as to Peterhouse, where the college embraced the "beauty of holiness" under Masters Matthew Wren (1626-1634) and John Cosin (1635-1642).[49] During the civil war the town of Cambridge was in the hands of the Parliamentarians: indeed Oliver Cromwell represented the town in the Long Parliament. What mattered during the civil war years was which group had the power, whether political, economic or military, to insist upon their own knowledge and suppress that of other groups. The inevitable result was that during the 1640s and 1650s attempts were made not only to purge the University of individuals with royalist or Anglican sympathies, but to realign the religious teaching at Cambridge to be acceptable to the Presbyterian majority in Parliament.

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[46] Richard Kidder, 'Autobiography', *Lives of the Bishops of Bath and Wells*, pp. 231-232. Kidder, a contemporary of Ray's at Cambridge and ordained by Ralph Brownrigg bishop of Exeter in 1658, had also been deprived by the Act of Uniformity, but later conformed and was appointed to Rayne by the earl of Essex, son of the noted royalist Arthur Capel, who had been executed after the siege of Colchester.

[47] *Ibid.*, pp. 2-5; Cooper, *Annals of Cambridge*, p. 328; Thomas Fuller, *The History of the University of Cambridge from The Conquest (London 1655)*, eds. Marmaduke Prickett and Thomas Wright (Cambridge/London: Cambridge University Press, 1840), p. 318.

[48] Fuller, *The History of the University of Cambridge*, p. 319; see also C. G. Cooper, *Annals of Cambridge*, Vol. III (Cambridge: Warwick and Co. 1845), p. 342.

One outcome of the University's loyalty to Charles was a determined effort by the Parliamentary masters to insist upon a godly community, especially one sympathetic to Puritan interests. According to one account, "The thing was absolutely determined by a peremptory decree, to plant a *new university* for propagating at least, if not inventing, a *new Religion.*"[50] Scholars faced insult, intimidation, and imprisonment; college properties were plundered, turned into prisons or used for quartering soldiers; chapels were defiled; and books, including the Book of Common Prayer, were burnt. This extended period of harassment, however, may have served primarily to make determined royalists defiant. A royalist eyewitness at Cambridge detailed the hardships suffered by loyal scholars:

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[49] D. Hoyle, 'A Commons investigation of Arminianism and Popery in Cambridge on the eve of the Civil War', *Historical Journal* 29(2) (1986), pp. 419-25.

[50] [John Barwick], *Querela Cantabrigiensis: or A Remonstrance by way of Apologie for the Banished members of the late flourishing University of Cambridge, By some of the said Sufferers* (London 1947), p. 19.

> And after this intrenchment for almost two years together, (we are forced with unspeakable griefe of mind to think) what prophanations, violence, outrages and wrongs our Chappels, Colledges and Persons have suffered by the uncontrolled fury of rude Souldiers, notwithstanding two several protections to the contrary . . . It is grievous to our memories to recount how our Vice-Chancellour and Heads of Colleges solemnly assembled in Consistory, being many of them threescore years old and upward, were kept Prisoners in the Publick schools . . . Yet all the encouragement of them could get from these was, perpetually to be harrowed by Plundering and tedious imprisonment to betray their Loialty, Learning and Consciences to the advancement of this present Rebellion. [but the result was the example set by Dr. Samuel Ward] whose dying words . . . were breathed up to heaven with his parting soule, GOD BLESS THE KING.[51]

By the time Ray entered the University in 1644, members of the Cambridge community had already experienced two years of instability. Imposition of the Solemn League and Covenant, Parliament's Oath of loyalty to the government, was being selectively enforced to remove 'malignant' members of the community, although Ray as a student would have been exempt from this requirement.[52] Scholars were "imprisoned or banished for our consciences, being not so much as accused of any thing else, only suspected of loyalty to our King and Fidelity to our Mother the Church of England."[53] At least 217 scholars were purged during 1644 and 1645, and replaced by those thought to be more sympathetic to the parliamentary regime.[54] Ray was seventeen years old when he entered Cambridge in June 1644 and he spent the next eighteen years involved in University affairs; it is impossible that Ray could remain unaware of the implications attached to individual actions and personal choices.

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[51] [Barwicke], *Querela Cantabrigiensis*, pp. 8-10; and Fuller, *The History of the University of Cambridge*, pp. 317-323.

[52] Cooper, *Annals of Cambridge*, p. 336.

[53] [Barwicke], *Querela Cantabrigiensis*, pp. 21, 26.

Ray began his studies at St. Catherine's college, which had been a singular haven of peace and stability at Cambridge. In the period immediately preceding the outbreak of hostilities in 1642, a House of Commons investigation sympathetic to the Puritan cause had found St. Catherine's to be the only college at the University to escape charges of 'innovation and abuses' in matters of religion.[55] The college itself closely followed the strict regime favoured by Emmanuel and had also benefited from the Mastership of Ralph Brownrigg, under whose guidance the college prospered both financially and in terms of the quality and quantity of students. Usually described as a strict Calvinist and friendly to the Presbyterians, Brownrigg nevertheless remained fully attached to the order of Church of England.[56] Brownrigg "eminent for his piety, gravity and learning" had been Vice-Chancellor of Cambridge in 1637, 1638, and again in 1643, a position he held during the visitation of the earl of Manchester, the Parliamentarian-appointed Chancellor of the University. It had been Brownrigg's duty, as Vice-Chancellor, to deliver the University's decision against financial support for Parliament. Within a year of Ray's arrival,

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[54] John Gascoigne, 'Isaac Barrow's Academic Milieu: Interregnum and Restoration Cambridge', *Before Newton: The Life and Times of Isaac Barrow,* ed. M. Feingold.(Cambridge, etc.: Cambridge University Press, 1990), pp. 250-290, esp. p. 250.

[55] Hoyle, 'A commons investigation', p. 24.

[56] *DNB*, Vol. 3, pp. 83-84. Brownrigg, appointed Bishop of Exeter in 1642, did not immediately assume his ecclesiastical responsibilities.

Brownrigg became the only member of St. Catherine's to be ejected for loyalty to the crown prior to 1650. In 1645, he preached the inauguration sermon of the king "wherein many passages were distasted by the parliament party," was imprisoned, fined, and ejected from Cambridge.[57] After Brownrigg's ejection, William Spurstowe was intruded as Master of St. Catherine's, and under his guidance, the college continued its extended period of calm. In 1641, Spurstowe had been one of the authors of *Smectymuus,* a Presbyterian pamphlet against Episcopacy, and in 1642 was the chaplain to John Hampden's Parliamentary regiment of 'green coats'.[58]

It is likely that Ray, as a junior scholar, would have had little or no contact with the College Masters; nevertheless, Brownrigg's ejection and Spurstowe's intrusion would have made clear to Ray the consequences of political alignment. Nevertheless, Ray's first choice was to leave the security of St. Catherine's College in 1646 to enter Trinity. Ray himself left no evidence of his reasons for changing colleges, although William Derham later reported that "at Catharine's Hall they chiefly addicted themselves to disputations, but in Trinity the politer arts and sciences were principally minded and cultivated."[59] We must accept such a retrospective claim by Ray's Anglican literary executor with caution.

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[57] Fuller, *The History of the University of Cambridge*, p. 322; Cooper *Annals of Cambridge*, p 389; Matthews, *Walker Revised,* pp. 6, 39.

[58] J. B. Mullinger, *The University of Cambridge. Vol. III, From the election of Buckingham to the Chancellorship in 1626 to the Decline of the Platonist Movement* (Cambridge: Cambridge University Press, 1911 rpt. 1969), p. 305; *DNB,* Vol. 18, pp. 843-844; Matthews, *Walker Revised*, p. 29. There were limits to even to Spurstowe's adherence to the Parliamentary cause, however; in 1649 he publicly opposed the judicial proceedings against Charles and refused the Oath of Engagement (the oath of loyalty to parliament without the King or House of Lords) for which he and six others were ejected from Cambridge in 1650.

[59] William Derham, "Select Remains of the Learned John Ray", *Memorials of John Ray* (London: Ray Society, 1846), p. 7.

Ray had originally been admitted to Trinity College,[60] but elected to enter St. Catharine's in June 1644, as a student of Daniel Duckworth. Since Ray remained there for eighteen months after Duckworth's death in May 1645, this appears not to be the immediate reason for Ray's change of college. Trinity, on the other hand, had suffered a disproportionate number of ejections in the preceding two years; indeed, there were so few scholars left at Trinity after the ejections, that the empty chambers began to be a matter of serious concern to the university authorities.[61] It is certainly possible that Ray made the change in 1646 because Trinity, one of the colleges particularly decimated by Parliamentary purges, offered more opportunities to a junior scholar.[62] However, Ray's second choice upon entering Trinity College was to study under the supervision of James Duport, a scholar known to be "a royalist in and out of season" and who had earned a reputation as the "official Royalist tutor."[63]

A client of John Williams, Bishop of London and among the most prominent scholars at Trinity, Duport had been appointed Regius Professor of Greek 1639, and prebendary of Lincoln in 1641. Although he refused to subscribe to the Covenant, Duport suffered ejection from only his stall at Lincoln.[64] Duport may have retained his living at Cambridge because of his reputation as a scholar,[65] or possibly because of his intimate knowledge of College finances.[66] In 1645 Duport was appointed Archdeacon of Stow and in 1646, the Lady Margaret's Professor of Divinity.[67] Duport's overt Anglican orientation and his close connection with a number of royalist gentry induced many to send their sons to Trinity; indeed during the course of civil war and interregnum, more than 180 sons of Royalists, including Isaac Barrow, would be sent to Cambridge to be under Duport's tutelage.[68] During a period when all individual actions, personal association and even possession of 'politically incorrect' literature had potential consequences, Ray's decision to study with Duport is significant as a declaration of sympathy with Anglican interests.

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[60] Ray was accepted as a student of Humphrey Babington, a friend of John Sandcroft, who refused the Engagement and was ejected in 1650; Matthews, *Walker Revised*, p. 291. Mullinger reports that Babington was ejected, among other reasons, for his part in forwarding the College plate to Charles I in 1642 so Babington's tenure may have seemed insecure. At any rate, Ray chose Duport as his tutor in 1646. Mullinger, *The University of Cambridge*, Vol. III, pp. 308-312, 385,

[61] Trinity, St. John's and Peterhouse especially suffered from Parliamentary ejections in 1645-46. Mullinger, *The University of Cambridge*, Vol. III, pp. 308-312; Alfred Kingston, *East Anglia and the Great Civil War* (London: Elliot Stock, 1897), pp. 318-320; Fuller, *History of the University of Cambridge*, pp. 321-322; Matthews, *Walker Revised*, pp. 36-41; John Gascoigne, "Isaac Barrow's academic milieu", p. 255.

[62] The Master, Thomas Comber, was ejected as a refuser of the Covenant and for forwarding college plate to the king. Comber was treated with exceptional rigour; despite his advanced age, he was not only removed but imprisoned. Mullinger, *The University of Cambridge*, p. 308 A majority of fellows and several scholars and conducts were also ejected. Matthews, *Walker Revised*, p. 39.

[63] John Gascoigne, *Cambridge in the Age of Enlightenment: Science, Religion and Politics from the Restoration to the French Revolution* (Cambridge: Cambridge University Press, 1989), p. 54.

In 1645, Thomas Hill, a graduate of Emmanuel, a rigid disciplinarian, and a client of the earl of Manchester,[69] replaced the royalist Comber as Master of Trinity College. Hill was among the University's strongest supporters of Calvinism, a vigorous advocate of religious reformation and as a preacher "he was especially distinguished by the fervour with which he insisted on that emotional form of religious belief which has been somewhat irreverently designated as 'Pectoral theology'."[70] More importantly however, Hill was an advocate of educational reform, especially favouring admission to the university based on ability rather than wealth and special favours. After his appointment as Master in 1645, Hill began rebuilding Trinity college by attracting suitably pious young men; academic excellence not political allegiance was the criterion for admission. Hill for instance, was said to be fond of Isaac Barrow and reputedly commented "Thou art a good lad: 'tis pity thou art a cavalier"; later Hill protected Barrow from expulsion after a royalist oration.[71] It is also reasonable to assume Hill's acquiescence with continued royalist sentiment at the college. In June 1648, coincident with a renewal of hostilities by royalist forces, especially in the formerly peaceful Eastern Association counties (notably in Essex, the first skirmish was a raid on the earl of Warwick's estate at Leigh's Park, near Braintree) the 'schollers of Trinity' engaged their Parliamentary opponents in a physical confrontation. As late as March 1653, reports continued that the outlawed Anglican Book of Common Prayer was being used in the Trinity Chapel.[72]

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[64] Matthews, *Walker Revised*, p. 10.

[65] Gascoigne, 'Isaac Barrow's Academic Milieu', p. 257.

[66] In 1645 Duport had been appointed to a committee to reform the finances of the University (along with John Worthington and Ralph Cudworth). This has been interpreted as an attempt to have the scholars reveal the secrets of colleges finances, in preparation for their expropriation by Parliamentary appointees; see Mullinger, *History of the University of Cambridge*, p. 338. Barwicke claims that in some colleges only one or two scholars remained "till such time as they have discovered unto them all the mysteries concerning their College revenues, and by that time they will find enow godly men of their own Tribe, Learned enough to pocket the profits of two Fellowships apiece, which is the end of this blessed Reformation;" [Barwicke], *Querela Cantabrigiensis* (London, 1685), p. 203.

[67] Mullinger, *History of the University of Cambridge*, p. 38; John Venn and J. A. Venn, *Alumni Cantabrigiensis*, Vol. 2, Part I (Cambridge: Cambridge University Press, 1922-27, rpt. Kraus, 1974-76), p. 76.

[68] James Anderson Winn, *John Dryden and his World* (New Haven and London: Yale University Press, 1987), pp. 42, 60-77; M. Feingold, 'Isaac Barrow: divine, scholar, mathematician', *Before Newton: The Life and Times of Isaac Barrow* (Cambridge: Cambridge University Press, 1990), pp.1-104, esp. pp. 10- 11.

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[69] Thomas Hill, *Six Sermons* (London, 1646). Hill's dedication thanks Manchester for protecting him "in the exercise of *My Ministry* from *Prelaticall Tyranny* in the worst of times."

[70] Mullinger, *The University of Cambridge*, pp. 333-334.

[71] Winn, *John Dryden*, pp. 58-60

My research also shows that Ray's chosen friends and associates at Cambridge had impeccable Anglican credentials. Ray's friendships with two Trinity students of strongly Royalist families, Peter Courthope and Timothy Burrell, are well known.[73] The Courthopes and the Burrells were closely intermarried and both families employed the same long-term strategy to survive the financially disastrous interregnum years, purchasing land from distressed Royalists then arranging marriages with those same royalist families to secure the estates for the future. Both Courthope's father and Burrell's father acquired land from the Campion family and jointly compounded for the estate after Sir William Campion was killed in the royalist cause during the siege of Colchester in 1648.[74] Peter's daughter and Sir William's grandson later married. Courthope's father also purchased the estate at Danny from George Goring, one of the Royalist leaders at Colchester; Timothy eventually married the daughter of Sir Henry Goring, brother of George.

Peter Courthope's family was originally from Kent, where they had been aligned with the royalist cause and may also have been active participants in the Cavalier uprisings of 1648 and 1653.[75] A Courthope uncle, John of Brinckley Kent, had been "gentleman pensioner to his late Majestie" during the civil wars, detained by Parliamentary forces, and "after long imprisonment he was released upon condition that hee should not returne unto his Majestie again. That not long after he dyed."[76] In Sussex, Peter's more famous relative George Courthope was a self-proclaimed Royalist and Church of England man.[77] During the civil war, in his office as Commissioner of Alienations, George had clandestinely sent funds to the King at Oxford.[78] He was elected Member of Parliament in 1655 although not allowed to sit, reelected in the Convention Parliament (1660) and again in the Cavalier Parliament in (1661), knighted at Charles's coronation in 1662 and appointed Deputy Lieutenant of Sussex in 1662.[79]

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[72] Cooper, *Annals of Cambridge*, Vol. 3, p. 423; Kingston, *East Anglia and the Great Civil War*, pp. 252-289; Gascoigne, 'Isaac Barrow's academic Milieu', p. 256.

[73] Ray dedicated *A Collection of English Words* (London, 1674) to Courthope; it was printed by Timothy Burrell's uncle, Thomas Burrell, who also printed Ray's popular school text, the *Dictionariolum Trilingue* (London, 1675).

[74] *Calendar of the Proceedings of the Committee for Compounding &c. 1643-1660*, pp. 1450-1451.

[75] Alan Everitt, *The Community of Kent and the Great Rebellion 1640-60* (Leicester: Leicester University Press, 1966), pp. 303-304.

Timothy Burrell was the son of Walter Burrell, a "swarn servant to the Queen" [Henrietta Maria], and had held a place at court. Walter publicly celebrated the restoration of Charles II by an annual gift to the poor of the parish; his name also appears on the list of individuals nominated for the Order of the Royal Oak, a knighthood proposed at the Restoration and intended to honour those whose long term service and loyalty to the King had been conspicuous during the Interregnum.[80] In 1674, Ray described the "manner of working the Iron at the forge or Hammer" from an account by "one of the chief-Iron-Masters in Sussex, my honoured friend Walter Burrel of Cuck-field, Esquire, deceased."[81]

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[76] George Courthope, 'Memoirs of Sir George Courthope (1616-1685)',*Camden Miscellany,* ed. C. S. Loomas, Vol. 11 (London: Royal Historical Society. 1907), p. 105; the editor cites S.P. Dom. Car. II. Vol. ii, no. 154.

[77] *Ibid.*, p. 141; Courthope was charged with using the Book of Common Prayer in his home when it was prohibited..

[78] *Ibid.*, p. 139, "So we returned from Oxford, with instructions to send all the money to the King that we had brought into the office, which we did, till discovered by a cleark. We had a severe reprimand from the Committee for doing it, but . . . we got off, not without great fear of losing our places, and the Committee stopped our salaries, telling us it was in their power to allow us anything or nothing as they pleased." Editor cites Thurloe States Papers v pp. 341, 383.

[79] *Ibid.*, p. 146.

The Cambridge associate most intimately connected with Ray was also related to the Courthopes and the Burrells. Francis Willughby's royalist pedigree was undisputed by contemporaries, including the Parliamentary leader at Nottingham, Col. Ralph Hutchison. His father, Sir Francis Willoughby, had been accused of being with the King at Coleshill in 1642, and of sending men, horses and arms to the King at Nottingham and to Spencer Compton, earl of Northampton (and father of Ray's future friend Henry Compton). After 1643, the Willoughby estate at Wollaton was garrisoned by Parliamentary forces and the Committee for Compounding fined Sir Francis £700. Despite this financial hardship, estate records also show that significant funds were forwarded to the King.[82] The Willoughby family also cultivated marriage alliances with prominent Royalist families. Sir

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[80] Robert William Blencowe, ed. , 'Extracts from Manuscripts in the possession of William John Campion, Esq. at Danny; and of Sir Thomas Maryon Wilson, Bart, of Charlton House, *Sussex Archaeological Collections* 10 (1858), pp. 1-35; William Smith Ellis,'The Manor of Hurst-Pierpont', *Sussex Archaeological Collections* 11 (1859), pp. 50-72; Rev. Cannon J. H. Cooper, 'Cuckfield Families III', *Sussex Archaeological Society,* 43 (1900), pp. 1-43; Philip Jenkins, 'Wales and the Order of the Royal Oak', *National Library of Wales Journal (Great Britain)* 24(3) (1986), pp. 339-51.

[81] John Ray, *A Collection of English Words* (London, 1674), p. 129; in the second edition (1691) this reference appears on p. 191.

[82] J. H. Hodson,'The Wollaton Estate and the Civil War, 1643-1647', *Thoronton Society Record Series* 21 (1962), pp. 3-15; Lucy Hutchison, *Memoirs of the Life of Col. Hutchison*, ed. James Sutherland (London, New York, Toronto: Oxford University Press, 1975), pp. 61, 99, 100 n.1, 304 n. 6; *Calendar of the Proceedings of the Committee for Advance of Money*, Part III (London, 1888), p. 1414; *Calendar for the Committee for Compounding 1643-1660*, Part II, p. 83 for February 25, 1647/48; see also December 15 1647 where Sir Francis Willoughby was provided relief for the "extreme necessity of his lady and children".

Francis's sister, Dorothy, was the wife of Henry Hastings, the second son of George, Earl of Huntingdon (and uncle to his namesake, the royalist general Henry Hastings, later Lord Loughborough.) Lettice, the sister of Francis, married Thomas Wendy, a 'Ship Money Sheriff' in Cambridgeshire during the 1630s who may have spent part of the Civil War abroad. In 1660, Wendy was elected MP in Cambridgeshire "by declaring to stand for the Parliament and a King and the settlement of the Church," was reelected to the Cavalier Parliament in 1661 and appointed a knight of the Bath at the Coronation of Charles II.[83]

It would be tedious to enumerate all the individuals connected with Ray during his tenure at Cambridge. Of those I have identified as contributing to Ray's natural history activities during the 1660s and 1670s, the majority had attended Cambridge, and especially Trinity College. I have found little evidence of Puritan or nonconformist sentiment among these individuals and much evidence to the contrary. Of Ray's own students from Trinity, eight became clergymen and conformed to the Anglican order after 1662. One student died: Edward Goring, son of Henry and brother of Timothy Burrell's fiancée. Another student, Henry German (or Jermin), who did not graduate from Cambridge, may also have had Royalist connections.[84] In fact, of all Ray's known associates during the Interregnum, only his pupil Philip Skippon can with certainty be assigned Parliamentary associations. Skippon was the fourth son of Major General Philip Skippon (d.1659), a close associate of Oliver Cromwell. However, there is no evidence that Skippon was other than a loyal supporter of the Restoration regime. He also travelled throughout Europe with Willughby and Ray, was elected a member of the Royal Society in 1667 and was knighted by Charles II in 1674.[85]

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[83] B. D. Henning, *The House of Commons 1660-1690,* Vol. 3 (London: History of Parliament Trust, Secker and Warburg, 1983), pp. 683-684; Mullinger, *History of the Cambridge*, p. 551; Samuel Pepys, *The Diary of Samuel Pepys*, ed Henry B. Wheatley, Vol. 1 (London: G. Bell and Sons, rpt. 1962), April 19, 1660, p. 107; *Notes and Queries,* July 7 and August 18, 1951.

[84] There are several grounds for this assumption. It is possible Ray's student was related to Michael Jermin or German, (d. 1659) ejected from St. Martin's Ludgate in 1643, although this individual had two daughters and apparently no sons. There had also been a William Jermin ejected from Oxford. *DNB*, vol. 10, p. 777; Matthews, *Walker Revised*, pp. 35, 52. Less likely, Ray's student may have been related to Henry Jermyn, described as 'extrovertly cavalier', son of Sir Thomas Jermyn MP for Andover, who had been the queen's master of the horse, spent the civil war years abroad and later became first Earl of St. Albans. Sir Thomas Jermyn was a friend of the bishop of Ardagh, William Bedell (d.1642), who had been born in Black Notley; *DNB Missing Persons* (1993), pp. 352-353.

CONCLUSION

Religious preference became an important indicator of civil war political allegiance: partisan politics tended to divide, in general, between those with a strong commitment to Godly reformation and Parliamentarian ideals, and those with a concomitant attachment to the Established church and the king. There has been no consensus on the matter of Ray's religious identity. While contemporaries accepted Ray's Anglicanism, modern historians have tended to interpret Ray within the reforming Puritan movement of early modern England, an ideological position which would have placed him in opposition to the established political order. My research suggests there is little evidence to support a Puritan orientation in Ray's outlook, and furthermore, this construction of Ray makes it difficult to account for his later fame as a spokesman for 'rational piety, sound philosophy and solid instruction' in the Anglican context. The evidence from Ray's Essex neighbourhood of Black Notley supports the claim of significant Anglican and loyalist sentiment during the politically hazardous years of the civil war and interregnum. At Cambridge University, those with whom Ray chose to identify himself tended to be conspicuously loyal and Anglican. With the sole exception of his young pupil Philip Skippon, all his friends and associates had unblemished royalist credentials. Thus, this evidence from Ray's early background suggests a position favourable to a Royalist and Anglican point of view.

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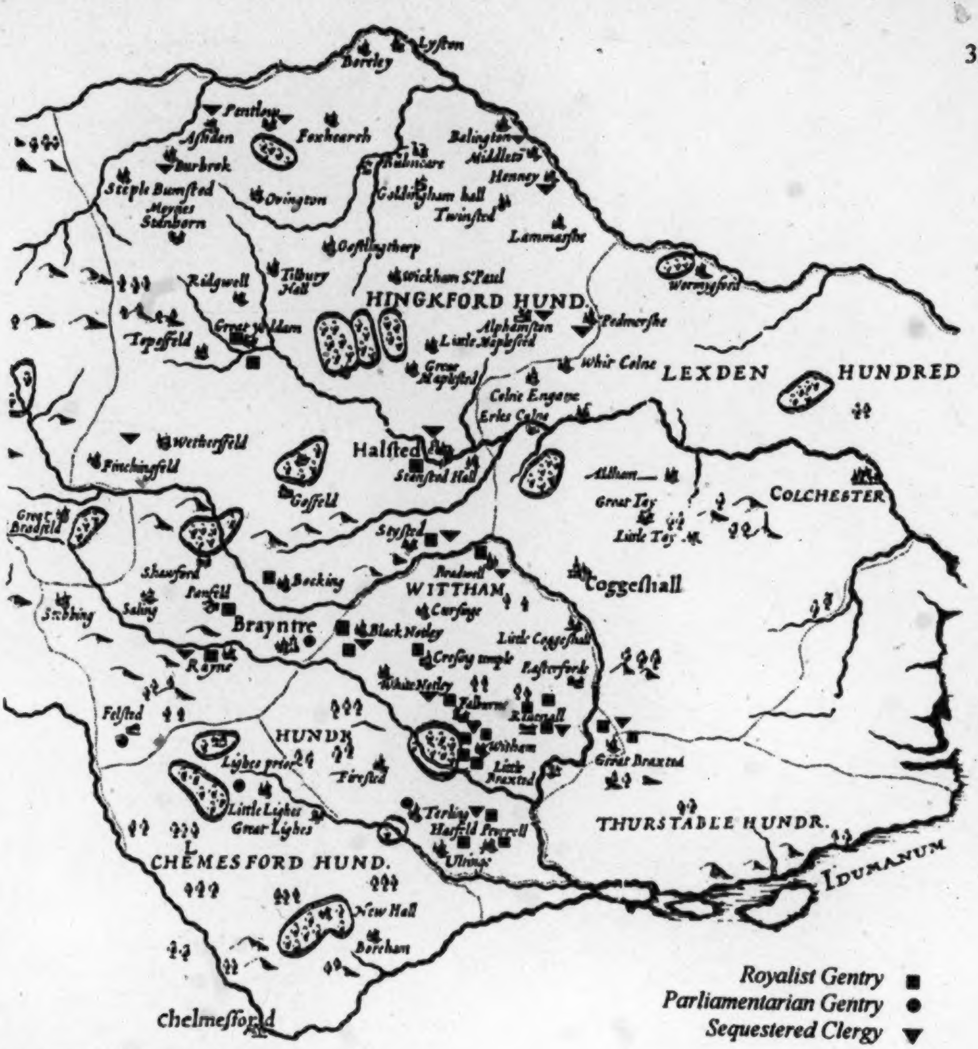
[85] Thomas Birch, *History of the Royal Society*, Vol. 2 (London, 1756), pp. 172-173. Phillip Skippon Esq. was proposed candidate by John Wilkins, and elected and admitted on 16 May 1667; Venn and Venn, *Alumni Cantabrigiensis*, Vol. 4, Part I, p. 86.

Civil war loyalties not only shaped contemporary culture but also persisted as a cohesive social force during the Interregnum and into the Restoration. Religious and political allegiances had important implications for the study of natural history, in particular, who engaged in the enterprise, how it was practised and how it was made acceptable as an Anglican gentleman's pursuit. Thus, it is crucial for our understanding of natural philosophy, and the development of the associated discipline of Natural History, to understand the loyalties and religious adherence of one of the pivotal designers of that discipline, the natural philosopher John Ray. The implications for Anglican and royalist natural history during the post civil war years will be discussed in the following chapter.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Goldingham hall
Twinsted
Lammarshe
Gestlingthorp
Ridgwell
Tilbury Hall
Wickham S.t Paul
HINGKFORD HUND.
Wormingford
Great yeldam
Topesfeld
Alphamston
Little Maplested
Pedmershe
Great Maplested
Whit Colne
LEXDEN
HUNDRED
Colne Engayne
Erles Colne
Wethersfeld
Finchingfeld
Halsted
Stansted Hall
Gosfeld
Aldham
Great Tey
Little Tey
COLCHESTER
Great Bradfeld
Styfted
Bradwell
Shawford
Bocking
Panfeld
WITTHAM
Coggeshall
Saling
Curfinge
Stebbing
Brayntre
Black Notley
Little Coggeshall
Crefsing temple
Rayne
Easterford
White Notley
Falborne
Rivenhall
Felsted
HUNDR
Witham
Great Braxted
Lighes prior
Little Braxted
Tirsted
Terling
Little Lighes
Great Lighes
Hatfeld Peverell
THURSTABLE HUNDR.
Ulting
CHEMESFORD HUND.
IDUMANUM
New Hall
Boreham
Chelmesford
Royalist Gentry ■
Parliamentarian Gentry ●
Sequestered Clergy ▼

MAP: Detail, John Speed's Map of the County of Essex, 1662

SOURCES

Matthews, A. G. *Walker Revised, Being a revision of John Walker's Sufferings of the Clergy during the Grant Rebellion 1642-1660*, (Oxford, rpt. 1988)
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Calendar of the Proceedings of the Committee for Compounding 1643-1660
Calendar of the Proceedings for the Advance of Money 1642-1656
Dictionary of National Biography

APPENDIX

ANGLICAN CLERGY AND LANDOWNING GENTRY

ESSEX COUNTY, 1642-60

> "The confusion which war and plunder introduced in the last century, among Estates and Families, occasions such chasms in history as cannot be filled up, notwithstanding the utmost care and industry."
>
> Philip Morant, 1778,
> *The History and Antiquities of the County of Essex*

WITHAM HUNDRED

1. Black Notley
   - Joseph Plume, Rector, ejected, appointed by Thomas Keightly
   - Thomas Keightly, civil war years in France
   - Richard Symmonds, compounded for his estates and imprisoned 1655 for participation in royalist conspiracy, *Calendar of State Papers* (Domestic Series), 1655, p. 367.

2. White Notley
   - George Barry, Vicar, ejected from Trinity
   - the rector is nominated by the owners of the Manor of Cressing Temple, i.e., Sir Thomas Smith (Nevil), but appointed by the Bishop of London

3. Cressing
   - Sir Thomas Smith, also known as Nevil, compounded for his estates £ 7,000

4. Faulkbourne
   - Edward Strutt, Rector, ejected, appointed by Edward Bullock
   - Edward Bullock, on lists for the Committee for the Advance of Money

5. Witham
   - Francis Wright, Vicar, ejected, appointed by the Bishop of London
   - Sir Thomas Smith, also known as Nevil (see Cressing)
   - William Smith, also known as Nevil compounded for £ 211 13*s*
   - Jerome Weston, s. and heir Of Richard, Earl of Portland, compounded for his estates £ 5291 11*s* 8*d*
   - Earl of Oxford (deVere) - not involved in Civil Wars but active as Royalists during the Interregnum

- Sir John Suckling, reported to have spent £ 12,000 in raising and supporting a troop of horse for Charles I

6. Hatfield Peverell
    - Francis Parker, Vicar, ejected
    - John St. John (d. 1597) - three brothers killed in the service of K.Charles

7. Brackstead Magna or Braxted Magna
    - Thomas Meighen, Rector, imprisoned, appointed by Benjamin Ayloff
    - Benjamin and his son William Ayloff compounded for £ 2000
    - Benjamin Ayloff imprisoned in 1655 for Royalist conspiracy, *Calendar of State Papers* (Domestic), 1655, p. 368
    - Mr. Roberts of Braxted, Imprisoned in 1655 for Royalist conspiracy, *Ibid.*
    - Mr. Freize, of Braxted, Imprisoned in 1655 for Royalist conspiracy. *Ibid.*

8. Rivenhall
    - George Boswell, Rector, sequestered, appointed by William Smith (Nevil) of the family of the same name in Cressing.
    - William Smith -see Witham
    - Wiseman family possessed of very large estates in the county - William Wiseman (b. 1600) married the daughter of Arthur Capel, and died in at Oxford 1643 in the service of Charles l.

9. Kelvedon, or Keldon (Parish of Easterford)
    - Peter Deards, Vicar, Sequestered, appointed by Bishop of London
    - Manor of Church Hall held by Bishop of London

10. Bradwell (by Coggeshall)
    - George Crackenthorp, Rector, sequestered, appointed by Sir William Maxey
    - Grenvill Maxey, 1645 Captain of the trained bands in Essex, d. 1648
    - Henry Maxey, Adjutant general of the Kings Horse
    - William Maxey *filius,* served the king in all his wars and was Major-General of horse at the Siege of Colchester

There were no ejections where Robert Rich, Earl of Warwick had large estates, at Terling where the manor was owned by Robert Mildmay who appointed the clergyman, or at Ulting, Little Brackstead; Coggleshall parva and Fairstead.

HINKFORD HUNDRED (selections)

1. Rayne
   - Edward Symmonds, Rector, Sequestered, appointed by Arthur Capel
   - Arthur Capel, compounded for £ 4706 , executed by Parliament in 1649 for royalist activities

2. Pantfield
   - Edward Jenkinson, Rector, Sequestered
   - Richard Fitz-Symmonds, related to Richard Symmonds of Black Notley and Edward Symmonds Rector of Rayne

3. Sisted
   - Christopher Newstead, Rector, Sequestered, nominated by Bishop of London
   - Thomas Wiseman (see Rivenhall, above)

4. Halstead
   - John Webb, Vicar, imprisoned, appointed by Bishop of London

5. Pebmarsh
   -Thomas Wibrow, Rector Sequestered,

6. Alphamston
   - Rowland Steward, Rector charged before Committee for Compounding March 1643/44, living in the gift of the crown

7.Heny
   - Charles Forbench, Rector, sequestered 1643, John White, *Century* No. 3

8. Castle Hedington
   - clergy not sequestered
   - Chief holding of the deVeres, the Earls of Oxford, not active Royalists until the Interregnum

9. Little Yeldon (Yeldham)
   - William Evett, Rector, sequestered, living the gift of the crown (found another living)

10. Ashen
   - William Jones, Rector, sequestered, living the gift of the crown (held plural livings)

11. Withersfield

- Philip Tenison, Vicar, sequestered, living the gift of Trinity Hall, Cambridge

12. Birdbrooke
    - John Thompson, Rector, sequestered

13. Middleton,
    - William Frost Rector, sequestered

14. Wickham
    - Timothy Clay, Rector, sequestered
    - manor held by the Dean and Chapter of St. Paul's

15. Pentlow
    - Edward Alston, Rector, sequestered 1644

16. Ashen
    - William Jones, Rector, sequestered (held plural livings)

At Braintree, Felsted and Bocking, livings were in the gift of Earl of Warwick, and there were no ejections.

Sources:
Calendar of State Papers (Domestic), 1655
Calendar of the Proceeding of the Committee for Compounding 1643-6660
Calendar of the Proceedings for the Advance of Money 1642-1656
Dictionary of National Biography
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CHAPTER 2

Politics, Polemic and Plants, 1650-1660

> *"I know of no occupation which is more worthy and delightful for a free man than to contemplate the beauteous works of Nature."*[1]

Individual allegiances and personal commitments forged during the turbulent decade of the civil wars continued to animate the political and religious debates of Interregnum England (1650-1660). A wide array of strategies and practices can be found in the written culture of the period which give expression to contemporary experience, as both the victors and the vanquished alike constructed self-conscious responses to display their partisan sentiment. The focus of this chapter is to explore how the literature of natural history entered the repertoire of cultural resources which were deployed within the Anglican community during Interregnum.[2] I would also like to suggest that a distinct culture of natural history emerged during the period, in which specific attitudes and practices towards the study and enjoyment of nature were encouraged among this group.

During the Interregnum, a body of natural history literature began to assume characteristics which closely identified the creators of such works with the ethos of sequestered Anglicanism. At precisely this historical moment, some Royalist gentlemen adapted their knowledge of nature and expressed their cultural conditions in the georgic form, a distinctive genre of polemical literature which served to both celebrate an enforced pastoral lifestyle and providing a forum for voicing discontent with the Commonwealth political order. The georgic, while lauding the conditions of nature more generally, was especially suitable for commemorating the pleasures of the garden. Anglican horticultural literature is important, however, not merely as a reflection of a loyalist political orientation, but also as a means to explain how the study of plants, their characteristics, and their cultivation became a respectable gentle pastime.

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[1] John Ray, 'The Preface', *Ray's Flora of Cambridgeshire*, p. 26.

[2] This of course is not to claim that natural history was the only means for Anglicans to express their dissatisfaction with Interregnum politics, nor that natural history was the sole activity for Anglican gentlemen. For instance, Graham Parry has shown how a renewed interest in England's past animated many Anglicans of this period; *Trophies of Time English Antiquiarians of the Seventeenth Century* (Oxford: Oxford University Press, 1995).

The mere existence of georgic literature, however, does not explain the translation of natural history from a gentlemanly activity into a rigorous intellectual undertaking. Therefore this chapter is also concerned with understanding the development of a scholarly natural historical tradition and its cultural dominance within a well-defined community. In particular, John Ray's *Catalogus plantarum circa Cantabrigiam* (Cambridge, 1660) shared many features of georgic literature: it was an expression of political discontent and a celebration of Anglican piety as well as functioning to identify Ray with the royalist community. At the same time, the *Catalogus* was also a work of specialized, technical botany for a narrow audience. The *Catalogus*, one of the founding documents of the discipline, shows how botanical practices and philosophical choices were promoted as legitimate and respectable. Ray depicted the activity of natural history as disinterested and uncontentious by providing the appearance of philosophical neutrality. Through exclusive appeal to a specific body of literature, 'proper' botanical authority was also relocated directly to members of an Anglican and Royalist community. These joint strategies ultimately provided a prescriptive model for the correct presentation of natural history texts but had the additional effect of defining the proper attributes for natural historians as well as the proper knowledge domain of natural history. Thus, Ray's approach in the *Catalogus* had implications for establishing consensus among participants in the enterprise, and were especially important in delimiting the proper conduct of natural historians during the Restoration.

Natural History

Natural history, of course, had long been respectable. In the ancient world, natural history, especially the study of plants and animals, was recognized as part of philosophy. The Greeks researched and reported on those productions of the natural world which they considered remarkable or worthy of note and which held significance for the philosophical acquisition of knowledge. *Historiae*, or the systematic collection of natural knowledge by Aristotle and his disciples, represented both reports of observed particulars and their incorporation into a general knowledge system. In addition, the study of natural history was integral to Aristotle's curriculum to educate the sons of the political class to be good citizens and to enable them to participate in the running of the state.[3]

With the recovery of ancient knowledge during the Renaissance, natural history also became part of the philological enterprise of humanists who were attempting to replace the 'inferior' compendia of the middle ages with the rediscovered natural history of the ancients. Notwithstanding the first-hand observations of the German naturalist and encyclopedist Conrad Gessner or the meticulous collections of the Italian natural philosopher Ulisse Aldrovandi, Renaissance natural history was especially concerned with the accumulation of literary references to natural phenomena such as "Homonymous and Synonymous words, or the diverse Names . . . , Hieroglyphics, Emblems, Morals, Fables, Presages, or ought else appertaining to Divinity, Ethics, Grammar, or any sort of Humane learning."[4] At first in Italy, but later throughout Europe, concern with natural history also came to include the possession of the rarities and curiosities of nature in museums and gardens. During the sixteenth and seventeenth centuries, collecting became an activity of choice among the educated and social elite who attempted through the possession of objects to acquire knowledge, and through their display to symbolically acquire the honour and reputation that all men of learning cultivated.[5] In fact, powerful individuals who sought to reinforce their political positions commonly employed a strategy to exploit the connection between knowledge and power by the patronage of natural historians.[6] The collection and display of natural history as a component of 'civic humanism', would continue to play an important role in the political landscape of early modern Europe.

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[3] Roger French, *Ancient Natural History: Histories of Nature* (London and New York: Routledge, 1994), esp. pp. 1-5, 11-15.

A similar but more modest collecting culture may also be found in early modern England, where natural rarities and artifacts were accumulated more generally by gentlemen. Museum catalogues such as John Tradescant's *Museum Tradescantianum or a Catalogue of Rarities* (London, 1647) or Robert Hubert's (alias Forges) *Catalogue of Many Natural Rarities* (London 1664), provide testimony to an unsystematic accumulation of curiosities.[7] In England, a further expression of the culture of natural history may be found in the magnificent gardens associated with the highest social classes. The royal gardens, as a site for masques and alfresco entertainment, became a vehicle for the deliberate display of monarchial power and prestige. Gardens especially came to be associated with the intersecting political and artistic policies of Charles I. Seen as 'Arcadia manifest', the royal gardens were the cultural expression of personal rule and the Caroline vision of peace and order.[8]

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[4] John Ray, 'Preface', *Ornithology of Francis Willughby* (London, 1678), sig. A4; see also William B. Ashworth, 'Natural History and the emblematic world view', *Reappraisals of the Scientific Revolution*, eds. David C. Lindberg and Robert S. Westman (Cambridge: Cambridge University Press, 1990), pp. 303-332; Michel Foucault, *The Order of Things: An Archaeology of the Human Sciences*, ed. R. D. Laing, Guillimard Edition (London: Tavistock Press, 1970).

[5] Paula Findlen, *Possessing Nature: Museums, Collecting and Scientific Culture in Early Modern Italy* (Berkeley, Los Angeles, London: University of California Press, 1994), p. 3.

[6] *Ibid.*, pp. 346-392.

Pleasure gardens served an additional function as outward signs of aristocratic magnificence, philosophical contemplation and as the concrete articulation of a stable, hierarchical and natural order. John Parkinson's lavishly illustrated *Paradisi in Sole, Paradisus Terrestris* (London 1629) epitomized the English garden aesthetic. In contrast to traditional herbals, practical books of simples or gardening manuals, the *Paradisi* was wholly concerned with gardens of pleasure and delight.[9] Princely gardens for display, contemplation and retreat were closely associated with the culture of leisure, property and 'gentle' learning, precisely the community which would suffer defeat during the civil war and exclusion from participation in the nation's governance during the Interregnum. For some individuals, the politically unrewarding decade of the 1650s provided an opportunity to renew their connection to the land and to refashion their knowledge of plants.

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[7] John Tradescant, *Museum Tradescantianum or A Collection of Rarities* (London, 1647) in Prudence Leith-Ross, *The John Tradescants: Gardeners to the Rose and Lily Queen* (London: Peter Owen, 1984); Robert Hubert alias Forges, *A Catalogue of Many Natural Rarities, with Great Industry, Cost and thirty years travel in Foraign Countries* (London 1664).

[8] Roy Strong, *The Renaissance Garden in England* (London: Thames and Hudson, 1979), pp. 10-11, 33, 202.

[9] Parkinson dedicated his book to Queen Henrietta Maria, the 'Rose and Lily Queen'. In tacit acknowledgement of the prevailing social order, Parkinson ranked the Crowne Imperial lily "first place in this our Garden of delight." John Parkinson, *Paradisi in Sole, Paradisus Terrestris* (London, 1629), p. 27.

Of course, educated men in the Middle Ages and the Renaissance had long been concerned with the study of plants, and the most fundamental reason for studying plants was to acquire knowledge of their medicinal properties. In the sixteenth century, chairs of botany had been established at the Universities of Rome, Bologna, Padua and elsewhere and botanical gardens were becoming an essential addition to university research and teaching facilities. While there was an expansion of interest in "*res herbaria*" during the late fifteenth and early sixteenth centuries, those who undertook systematic and detailed studies of plants continued to be primarily medical students, doctors and apothecaries.[10] Prior to the civil war in England, it was rare to find individuals other than medical professionals dedicated to the study of plants. With few exceptions, all books published on the subject were written by physicians or apothecaries, including the beautifully illustrated *Herbal* of John Gerard and Parkinson's *Paradisi in Sole*.

Georgic Literature as Post-Civil War Royalist Trope

During the 1650s, horticultural and botanical works began to appear in England whose authors were far removed from the medical profession and whose contents were far from utilitarian. In particular, a novel genre of georgic literature developed as loyalist gentlemen constructed new strategies to express their political sympathies. This Anglican gardening and botanical literature is important as a cultural expression of loyalty, but also as a means to understand the emergence of an identifiable botanical tradition.

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[10] See especially Karen Reeds, *Botany in Medieval and Renaissance Universities*, Harvard Dissertations in the History of Science Series, ed. Owen Gingerich (Garland: New York and London, 1991).

The Royalists remained a distinct and generally cohesive group which shared a common set of values and a similar culture during Interregnum England. For many, their common identity was defined by the trauma of the battlefield and the bitter experience of defeat. Their common cause was defined by loyalty to the Stuart monarchy, a determination for its restoration and an attachment to the order of the Anglican Church. While it is true that large numbers of royalist sympathizers did not actively participate in the civil war, during the Interregnum Stuart loyalists were unified by exclusion from both national and local political power, and by the financial burdens placed upon this group by the parliamentary sequestration committees. For some, royalist solidarity was expressed in the 'habit of conspiracy', manifested in a series of unsuccessful military skirmishes during the decade.[11] For others, the royalist aesthetic was characterized by retreat and seclusion, and manifested in a literature of contest, polemical intrigue and partisanship.[12]

Specific genres of literature define common culture and interests, as well as acknowledge shared experiences. Steven Shapin, for instance, has convinced us that "members of early modern gentle society were highly skilled at discovering the relevant realities and using that knowledge to enforce the boundaries and conditions of social membership."[13] This was especially the case during the politically unrewarding decade after Charles I's execution. The politically charged decade of Interregnum England was permeated with partisan ambitions and polemical suspicion, not just among the political actors themselves, but among those who invented and consumed the products of higher English Culture. We are familiar with the well-known partisan works of, among others, John Milton, Andrew Marvell and John Dryden. Milton, the official apologist for the Commonwealth, was appointed Latin secretary to the Council of State for his defence of the republicans in *The Tenure of Kings and Magistrates* (1649). The poetry of Andrew Marvel also belongs to the civil war and interregnum period when he was employed successively as tutor by General Fairfax and Oliver Cromwell, and later as assistant to John Milton. John Dryden began his career in sympathy with the Parliamentarians, and his first works include *Heroic Stanzas* (1658) written on the death of Cromwell.

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[11] David Underdown, *Royalist Conspiracy in England 1649-1660* (Archon Press, 1971).

[12] Steven N. Zwicker, *Lines of Authority: Politics and English Literary Culture 1649-1689* (Ithaca and London: Cornell University Press, 1993).

In the culture of sequestered royalism, the dangerous dynamic of political contests and the hazards of partisan factions were especially important in the post civil war literature of Stuart loyalists, "as a site for and as a way of giving shape and authority to the conduct of polemical argument."[14] One of the characteristics which fixes loyalist Anglican modes and manners within the political culture of the 1650s was a renewed emphasis on the conditions of life in the countryside. The georgic, identified by its specificity and particularism, and by its didactic and knowledgeable voice, was renewed as a literary form during the 1650s,[15] undoubtedly inspired by the *Georgics,* Virgil's celebration of withdrawal from civil war and political chaos in first century BC Rome.[16] Izaak Walton's *The Compleat Angler* (1653) is, of course, the classic text of georgic retreat declaring the culture of sequestered royalism; it was among the texts used to express political resistance, to enunciate a version of political authority, to promote an alternate stable and harmonious social order, and to reinforce the notion of an ordered and hierarchical political society.[17]

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[13] Shapin, *A Social History of Truth*, pp. 42-64, esp. p. 43; A. Fowler, 'Georgic and Pastoral: Laws of Genre in the Seventeenth Century', *Culture and Cultivation in Early Modern England: Writing and the Land*, eds. Michael Leslie and Timothy Raylor (Leicester and London: Leicester University Press, 1992), pp. 81-90.

[14] Zwicker, *Lines of Authority*, p. 10; Lois Potter, *Secret Rites and Secret Writing: Royalist literature 1641-1660* (Cambridge, New York, etc.: Cambridge University Press, 1989), pp. 133-139.

Another strategy for royalist writers was to situate their criticism within a garden setting, at once symbolic of the Caroline aesthetic as well as identifying the culture of Stuart Royalists. The royalist garden literature expressly sought to repudiate the genre of agricultural improvement, the response by Commonwealthsmen against the culture of aristocratic gardens. The Commonwealth literature of agriculture was dedicated to utility, the productive use of land for the general good, and the promise of God's bounty to the rationalization of gardens and estates.[18] Frequently associated with Samuel Hartlib's *The*

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[15] Fowler, 'Georgic and Pastoral,' p. 83.

[16] Virgil's family estates had been confiscated to provide land for the veterans of Mark Antony's and Octavian's army, and later during the civil wars he withdrew to the security of the countryside to write the famous four books on agriculture and husbandry. *Chambers Biographical Dictionary,* Centenary Edition, Melanie Parry, etc. (Edinburgh and New York: Chambers, 1997), pp. 1982, sv Virgil.

[17] Zwicker, *Lines of Authority*, pp. 8, 60.

[18] See for instance J. Dixon Hunt, 'Hortulan affairs; *Samuel Hartlib and Universal Reformation: Studies in Intellectual Communication*, eds. Mark Greengrass, James Britten, Leslie Michael and Timothy Raylor (Cambridge: Cambridge University Press, 1994), pp. 321-342; Timothy Mowl, 'New science, old order: the Gardens of the Great Rebellion,' *Journal of Garden History* 13 (1993), pp. 16-35; and, especially , Joan Thirsk, 'Agricultural Innovations and their Diffusion,' *The Agrarian History of England and Wales,* Vol. V, Part ii (Cambridge: Cambridge University Press, 1985), pp. 533-589, esp. 533-542. The classic study of

Reformed Husbandman (1651), Gerald Boate's *The Natural History of Ireland* (1652) and Walter Blith's *The English Improver or the Survey of Husbandry* (1649 and 1653),[19] these works were part of the Puritan message promoting "love and good works on earth" and the acquisition of appropriate knowledge "relevant to the comforts and public use of society" as well as part of the preparation for the rule of the saints on earth.[20]

In contrast, the botanical and gardening literature of the royalists emphasized themes ubiquitous to contemporary Stuart gentlemen: that is, concern with the company and friendship of men, philosophical retreat and the contemplation of pastoral pleasures.[21] Gardens were especially evocative of the culture of seclusion, providing a refuge from a perceived corrupt political world, and offering the promise of recovered innocence and prosperity.[22] The theme further recalled the emblems of peace and order associated with the gardens of the Stuart monarchy and its political and artistic policies, an association

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Samuel Hartlib and his circle is Charles Webster, *The Great Instauration: Science, Medicine and Reform, 1626-1660* (London: Duckworth, 1975).

[19] Samuel Hartlib, *The Reformfd [sic] Husbandman; or a brief Treatise of the Errors, Defects and Inconveniences of our English Husbandry* (London, 1651); Gerald Boate *Ireland's Natural History . . . Conducing to the advancement of Navigation, Husbandry and other profitable Arts and professions* (London 1652); Walter Blith *The English Improver or a New Survey of Husbandry* (London 1649). The first edition of Blith's text was dedicated to "those of the High and Honourable Houses of Parliament; the third edition in 1653 was addressed to "the Right Honourable the Lord General Cromwell, and the Right Honourable the Lord President, and the rest of that most Honourable Society of the Council of State".

[20] Webster, *The Great Instauration, p.* 509.

[21] Zwicker, *Lines of Authority*, pp. 60-90; Potter *Secret Rites, Secret Writing*, pp. 133-139.

[22] See for instance, Andrew Cunningham, 'The culture of gardens', *Cultures of natural history*, eds. N. Jardine, J. A. Secord and E. C. Spary (Cambridge: Cambridge University Press, 1996), pp. 38-56; Paula Findlen, *Possessing Nature*, pp. 92-93, 112-113; John Prest, *The Garden of Eden: The Botanic Garden and the Re-Creation of Paradise* (New Haven and London: Yale University Press, 1988); and Strong, *The Renaissance Garden in England*, p. 33. For a discussion of financial hardships suffered by the royalists under the Commonwealth, see Thirsk, 'Agricultural Innovations and their Diffusion,' pp. 533-589.

affirmed by Parliamentarian destruction of the royal gardens after the Civil Wars.[23] Botanical literature was also imbued with notions of privilege and scholarly learning, the traditional preparation for gentlemen to lead lives as virtuous citizens within the state. Finally the study of plants and the contemplation of gardens were constitutive of natural philosophy, the intellectual justification of the study of God and his creations.[24] Given our understanding of religion and politics as a combined enterprise in seventeenth-century England, it should not surprise us that the enterprise of natural philosophy, and therefore also the study of plants, was inherently political. In this circumstance, different religious commitments would also differ in their concepts of God, his nature and his attributions and in their motivations to study nature as well as in their methods to study the works that God created.[25] The trope of the pleasure garden, the expression of political discontent, the appeal for social harmony, and the piety of the Anglican community were expressed by an array of gentlemen and honorary gentlemen, and took a variety of forms during the Interregnum. Three contributions to the royalist literature on gardens include Robert Fuller's *The Speech of Flowwers* (1662), John Evelyn's *The French Gardiner* (1657), and Thomas Browne's *The Garden of Cyrus* (1658).

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[23] John Evelyn recorded in his *Diary* "I returned to London; calling in by the way to see his majesties house and gardens at Theobalds (since demolished by the rebells)." John Evelyn, *Diary of John Evelyn,* ed E. S. DeBeers, Vol. II (Oxford: Clarendon Press, 1955), p. 81 and fn. 2; see also Strong, *The Renaissance Garden,* pp. 10-13, 33, 164, 220-221.

[24] For a discussion of the role of natural philosophy, see especially French and Cunningham, *Before Science*; Cunningham 'How the *Principia* Got its Name' pp. 377-392; and Cunningham ,'Getting the Game Right', pp. 265-388.

[25] See French and Cunningham, *Before Science;* and John Hedley Brooke, *Science and Religion: Some Historical Perspectives,* The Cambridge History of Science Series (Cambridge: Cambridge University Press, 1991).

During the late Interregnum, the moderate Anglican divine Thomas Fuller (1608-1661) had circulated to a select audience a manuscript entitled *Antheologia or The Speech of Flowwers, Partly Moral partly Mystical*. In 1643, Fuller had retreated to Oxford, become Chaplain to the Royalist Commander Sir Ralph Hopton, and by 1644 had been appointed Chaplain to the Kings' infant daughter, Princess Henrietta. Fuller lived quietly as a member of the royal household until 1648 or 1649 when he retired to Essex to become Chaplain to the second earl of Carlisle (the son of Lionel Cranfield first earl of Middlessex), and perpetual curate at Waltham Abby.[26] Fuller is familiar as the author of numerous interregnum works, including the *History of the University of Cambridge* (1655), which devolved into a litany of the sufferings of Cambridge scholars at the hands of their Parliamentarian masters during and after the Civil War.[27] In his popular character book *The Holy State: The Profane State,* which was reprinted several times during the period, Fuller also directed a satirical work at Oliver Cromwell, entitled *Andronicus or the Unfortunate Politician.* [28] The *Speech of Flowwers* was published after Fuller's death in 1662 by the London bookseller and printer John Stafford, who cautioned his readers against imputing "my flowers with pestilent and unintended interpretations, as if any thing more than flowers were meant in the flowers."[29] Despite such pleadings of innocence by the Restoration printer, however, this work was a thoroughly polemicized document.

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[26] *DNB*, vol. 7, pp. 755-760; James R. Ruoff, *Crowell's Handbook of Elizabethan and Stuart Literature* (New York: Thomas Y. Crowell, 1975) pp. 65-67, 165; *Biographia Britannica*, Vol 3, pp. 2049-2069.

[27] Thomas Fuller, *The History of the University of Cambridge from the Conquest* (London 1655, rpt. Cambridge, London: Cambridge University Press, 1840).

[28] Thomas Fuller, *The Holy State. The Profane State* (Cambridge, 1642, 1646, 1648 and 1663).

[29] John Stafford, Introduction to *The Speech of Flowwers, Partly Moral, Partly Mystical* by Thomas Fuller (London 1662).

The *Speech of Flowwers* was a botanical fable, a moral tale specifically designed to appeal to a well-defined cultural audience which had experienced the execution of a king, military rule and exclusion from their traditional role in the country's governance. Reminiscent of Thomas More's *Utopia,* or Francis Bacon's *Atlantis*, Fuller symbolized England as an earthly paradise governed by a garden parliament where flowers sat in the upper, and herbs and other plants, in the lower part. Within this paradise, the Rose had precedence over all plants "by right" and by the possession of the most noble qualities and virtues. But the rose, shedding white tears down red cheeks, had been usurped by a "Toolip" a vulgar plant of barbarian Turks and "fit only to be grown in the gardens of Yeomen." Upon his death the Rose became "more Sovereign than Living" and the nation suffered widespread discord, disagreement and disorder. The fable involved parliamentary debate, rivalry between the upper and lower garden, and the release by the "Toolip" of a wild boar into the garden to cause indiscriminate destruction. Dissension within parliament, conflicting social and religious values, antipathy toward the Army, and even contrasting philosophical stances would have been apparent to its contemporary readers.[30]

Fuller's parable was unmistakably contentious and highly critical of the prevailing order of Interregnum England. By 1662, however, *The Speech of Flowwers* was a late entry into a select group of botanical works dedicated to promoting the culture of sequestered Stuart loyalists, which included *The French Gardiner* (1658) by John Evelyn, who was already well versed in the hazardous game of polemical writing. The second son of a prosperous landowner, Evelyn (1620-1704) had remained steadfastly loyal to the king and to the Church of England, but took no part in fighting during the Civil War. He did, however, play a role at the royal Court in France where his father-in-law, Sir Richard Browne, was Charles I's representative in Paris. In 1648, Evelyn returned to England and retired to his estate and gardens near Deptford.[31] Evelyn's first foray into political writing, *Of Liberty and Servitude* (1649) was a translation of the French treatise *De la Liberté et de la Servitude.* Evelyn employed a common strategy of the period to announce that the book was contentious;[32] that is, he withheld disclosure of his authorship by writing under a pseudonym, in this instance using the politically charged name, *Phileleutheros,* a Greek term literally meaning a lover of liberty or freedom.[33] Evelyn's contribution to this work was the short preface 'To the Reader' in which he recalled the freedom "under which, we ourselves have lived during the Reign of our most gratious Soveraigne's *Halcion daies*" and condemned the lack of liberty experienced by many under

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[30] The association of Turks with Parliamentarian rule was a well understood symbol. For instance, Thomas Browne similarly conflated Turks and Tulips in his own metaphorical work, *The Garden of Cyrus*. He remarked that "the Turks who pass their days in Gardens here . . . must have Lilies and Roses in Heaven" although he also claimed that the "Tulipists stand saluted with hard language, even by their own Professors." Thomas Browne, 'Dedication to Nicholas Bacon,' *The Garden of Cyrus*, (1658), sig. E-Ev. In 1672 Sir Robert Vyner resculpted the equestrian statue of John Sobieskby trampling on a Turk to symbolically depict Charles II trampling on Oliver Cromwell; Ronald Knowles Introduction to *The Entertainment of His Most Excellent Majestie Charles II in His Passage through the City of London to His Coronation, London 1662,* by John Ogilvie, Facsimile Edition (Binghamton, NY: Medieval & Renaissance Texts and Studies Vol. 43, 1988), p. 15.

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[31] *DNB,* Vol.6, pp. 943-947; Ruoff, *Crowell's Handbook,* pp. 140-141.

[32] Zwicker, *Lines of Authority,* pp. 16-17.

[33] From *philos,* love; and *eleutheros,* free. The *Oxford Dictionary of Byzantium,* ed. In Chief Alexander P. Kazhdan, Vol. 1 (New York, Oxford: Oxford University Press, 1991), p. 685. The term *eleutheros* was first applied to things with the notion of freedom "from any powerful and fiscal hand as well as from any private ownership." 'Eleutherian' was also the title applied to Zeus as protector of political freedom.

Parliamentary government.[34] Claiming to be published under 'Royall Privilege' only days prior to the execution of the King, the use of a *nom de plume* did not disguise Evelyn's authorship or eliminate the perils of polemical writing. Although he escaped serious retribution, Evelyn recorded that he had been "severely threatened" for this undertaking and feared that "I was like to be call'd in question by the Rebels."[35]

Evelyn's *The French Gardiner* (1658) was another translation, in this instance of *Le Jardiniere Français* by Nicholas de Bonnefons. Evelyn's own copy of this book was a 1656 edition, so we may assume that he began translation no earlier than that date. As with *Of Liberty and Servitude*, this work also was published under politically charged circumstances. In September 1656, Evelyn recorded that the younger Sir Henry Vane (1613-62) had been imprisoned for "a foolish book he published."[36] Meanwhile the Commonwealth government was renewing its efforts to eliminate the Anglican faithful by threats and intimidation, including widespread raids on known places of Anglican worship. On Christmas Day 1657, Evelyn recorded his own experience at Anglican services where Commonwealth soldiers surrounded the facilities and "held their muskets against us as we came up to receive the Sacred Elements, as if they would have shot us at the altar."[37]

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[34] [John Evelyn], *Of Liberty and Servitude, translated out of the French into the English Tongue and Dedicated to Geo: Evelyn, Esquire* (London, 1649).

[35] John Evelyn, *The Diary,* Vol. 1, p. 547. Evelyn was well aware of the risks involved in making the work available in the political climate of January 1649. On December 18, 1648, Evelyn recorded "I got privately into the Council of the Rebell *Army* at Whitehall, where I heard horrid villanies." On January 17, "I hear the rebell *Peters* incite the Rebell powers met in the Painted Chamber, to destroy his Majestie & saw that arch Traytor *Bradshaw* who not long after condemn'd [the King]".

[36] Evelyn, *Diary,* p. 183.

[37] Evelyn, *Diary,* pp. 203-204.

Despite, or perhaps because of such intimidation, during 1658 Evelyn prepared and published another partisan work, *The French Gardiner*, and again advertised its contentiousness by using the Greek pseudonym *Philocepos*, literally meaning "lover of gardens."[38] However innocuous the literal meaning, *cepos* also had undoubted political overtones. The term was principally associated with culture and cultivation, and Evelyn drew clear parallels between the civilized activity of pleasure gardening and the uncultivated wilderness of political activity. The pointed contrast between the cultured and the uncultured would be fully appreciated by his audience of sequestered Royalists attempting to find solace in their restricted political role. An ancillary definition of *cepos* to designate a certain fashion of wearing one's hair may also have drawn attention to a feature of civil war allegiances superficially distinguished by hairstyle.[39]

Ostensibly, *The French Gardiner* was about a continental method of gardening in frames, but to praise the French was also to highlight its association with the exiled Stuart court in Paris and alerts us to the contestative nature of the book. Evelyn dedicated this work to his friend, Thomas Henshaw (1618-1690), a "*Lover of Gardens,*" who had fought in the King's army, been imprisoned for his loyalty, and in 1654 had printed a work in which he called Cromwell "the greatest murtherer" for his part in the execution of Charles

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[38] [John Evelyn], *The French Gardiner: Instructing How to Cultivate all sorts of Fruit-Trees, and Herbs for the Garden: Together with Directions to dry and conserve them in their Natural, ... First Written by R.D.C.D.W.B.D.N., and now transplanted in to Euglish [sic] by Philocepos* (London, 1658).

[39] From *philos*, love; and *cepos*, garden, cultivated like a garden. An alternative definition designates a certain fashion of wearing one's hair; Henry George Liddle and Robert Scott, *Greek English Lexicon*, rev. and aug. Henry Stuart Jones and Roderick McKenzie, 9th edn, 1940 with a revised Supplement (Oxford: Clarendon Press, 1996), sv κηποσ.

I.[40] The importance of reading this book within the context of the Interregnum is apparent when we note that Restoration editions of the work were published using Evelyn's own name and with an entirely revised dedication to Henshaw. In 1658, Evelyn cautioned Henshaw, as well as his readers,

> And in the mean time that the Great ones are busied about Governing the World (which is but a wilderness) let us call to minde the Rescript of Dioclesian to those who would persuade him to re-assume the Empire. For it is impossible that he who is a true Virtuoso, and has attain'd a facility of being a good Gardiner, should give jealousie to the state where he lives. This is not advise to you who knows so well how to cultivate both your Self and your Garden: But because it is the only way to enjoy a garden and preserve its reputation. [41]

Evelyn persisted in his venture of polemical authorship by printing another anonymous work, *An Apologie for the Royal Party* (1659).[42] Evelyn continued to perceive his publishing ventures as risky: the relevant entry in his *Diary* claimed "Was publish'd my bold Apologie for the King in this time of danger, when it was capital to speak or write in favour of him. It was twice printed."[43] Despite the political uncertainty, Evelyn also sent a manuscript outline of his plan for an ideal garden to his longstanding correspondent Dr. Thomas Browne, the Norwich physician. Evelyn invited Browne to join a select community of gentlemen in a scheme for a college of natural philosophy, or as Evelyn termed it, "a society of the *Paradisi Cultores*."[44] Evelyn justified his proposal in precisely the terms we have come to associate with sequestered royalism. The garden would become a refuge "amidst this clashing of weapons" [*inter hos armorum strepitus*] and a haven from the political wilderness. The garden was also to be a site for pleasure as well as philosophy; Evelyn wrote

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[40] *DNB*, Vol. 9, pp. 585-586.

[41] Evelyn, 'The Preface', *The French Gardiner*, sig. A3v, A4.

[42] [John Evelyn], *An apology for the royal party written in a letter to a person of the late councel of state by a lover of peace and of his country; with a touch at the pretended pleas for the army* (1659).

[43] Evelyn, *Diary*, Vol. III, p. 235.

[44] Letter to Dr. Brown from John Evelyn, 28 January 1659-60, *The Works of Sir Thomas Browne*, ed. Geoffrey Keynes, Vol. 4 (London: Faber and Faber, 1964), pp. 273-279. The Society was designed for "persons of ancient simplicity, paradisean and horutlan saints, to be a society of learned and ingenuous [sic] men".

> Our drift is a noble, princely, and universall Elysium. Capable of all the amoenities that can naturally be introduced into gardens of pleasure. And as such as may stand in competition with all the August designes and stores of this nature, either of antient or modern times, yet so as to become useful and significant to the least pretences and facilities. We will endeavour to show how the air and genious of Gardens operate upon humane spirits towards virtue and sanctitie. I mean in a remote, preparatory and instrumentall working. How Caves, Grotts, Mounts and irregular ornaments of gardens contribute to contemplative and philosophical enthusiasme.[45]

The invitation for Browne to be a member of the exclusive "*Paradisi Cultores*" further highlights the shared culture of Stuart loyalists during the late interregnum. In 1658, Browne had published another edition of his appeal to tolerant Anglicanism, the *Religio Medici*, to which he had appended the tract, *The Garden of Cyrus,* an agreeable display of arcane knowledge, literary scholarship and botanical acumen.[46] Contemporaries such as John Ray and Henry Power examined this work for botanical merit,[47] however,

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[45] *Ibid.*, "hortulane pleasures, these innocent, pure, and useful diversions might enjoy the least encouragement, whilst brutish and ambitions persons seek themselves in the ruines of our miserable yet dearest country." For a discussion of Evelyn's planned philosophical society of secluded royalists, see Graham Parry, 'John Evelyn as Hortulan Saint', *Culture and Cultivation in Early Modern England: Writing and the Land,* eds. Michael Lesley and Timothy Raylor (Leicester and London: Leicester University Press, 1992), pp. 130-50.

[46] Thomas Browne, *The Garden of Cyrus or the Quincunical Lozenge, or Net-work Plantations of Ancient, Artificially, Naturally, Mystically considereth, with Sundrey Observations* (London, 1658). In addition to the *Religio Medici* the volume also contained Browne's antiquarian contribution, *Discourse of the Sepulchrall Urnes lately found in Norwich.* The second printing of *The Garden of Cyrus* (1659) appeared with Browne's well-known *Pseudodoxia Epidemica.*

[47] Henry Powers responded with a series of letters to Browne concerning plant reproduction; see letters dated 9 November 1658, 10 May 1659, and 8 June 1659, *The Works of Sir Thomas Browne,* Vol. 4, pp. 264-270. John Ray also cited the *Garden of Cyrus* in his *Catalogus Cantabrigiam* (1660), see below. See also E. S. Merton, 'The Botany of Sir Thomas Brown,' *Isis,* Vol. 47 (1956), pp. 161-171.

Browne himself claimed that "we write no herball."[48] Even if we accept Browne's disclaimer as the obligatory expression of authorial modesty, the book bears slight resemblance to the traditional herbal format and possesses all the hallmarks of a work devoted to political criticism. The Cyrus named in the title was not, as may have been expected, one of the many ancient physicians of that name. Rather, Browne identified Cyrus as the founder of the Persian empire, *"a person of high spirit and honour, naturally a king,"*[49] who had been welcomed as the legitimate heir into the kingdom of Persia to replace an unpopular and harsh tyrant. In other words, Brown intended a Royalist audience by specific appeal to Philomen Holland's greatest undertaking, a translation of Xenophon's *Cyrupaedia, or the Institution and Life of Cyrus King of Persians* (1632) which had been dedicated to Charles I. On these terms, the story would have been familiar to an individual classically educated and 'cultivated' and who longed for the return of England's legitimate heir.

Browne's allusion to the Garden of Cyrus however, was merely to signal polemical intent. The real purpose of the book was to use the metaphor of the garden as a site for political criticism. Cyrus, reputed to be the founder of the famed hanging gardens of Babylon, was called the "splendid and regular planter," and believed to have been personally responsible for planting a perfectly ordered garden in his kingdom and therefore, by implication, imposing stability and order on the nation. Browne's speculations began with the Garden of Eden, in which the Tree of Knowledge was placed in the centre, recalling again the ubiquitous association of gardens and natural philosophy. Describing the organization of symbolic gardens of the past, Browne's message dilated upon the "quincunx," an orderly arrangements of parts into five, "wherein the fifth place is Soveraigne" and according to Pythagorean philosophy, the number of justice, implicitly declaring that not only had Interregnum government been disorderly, it had also been unjust.[50] Browne used the garden as a metaphor for change "since the verdent state of things is the Symbole of Resurrection."[51] The time had come, Browne proclaimed, to plant a new garden where "all things began in order, so shall they end, and so shall they begin again according to the ordainer of order and mystical Mathematics of the City of Heaven."[52] Thus the trope of the garden and the personification of Cyrus as the ideal philosopher king became the instrument by which Browne gave expression to the widespread desire for political change, anticipated the return of Charles II and the reestablishment of the Anglican Church.

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[48] Browne, 'Dedication to Nicholas Bacon,' *The Garden of Cyrus*, sig. E, Ev.

[49] *Ibid.*, p. 48. Browne relied on Xenophon's account of Cyrus, who depicts an "ideal philosopher king," endowed with "all virture, courage and wisdom', and who subsequently established a great empire. Cyrus was raised at his grandfather's court, and was offered the throne of Babylon by the nation. In the occasionally conflicting account of Herodotus, Cyrus acquired the throne at the request of a large party of allies within the nation who accepted Cyrus as their king because he was the legitimate heir, because of the harsh rule of the previous government and because the presumptive heir was "effeminate". For our modern understanding of several accounts of Cyrus, see *The Dictionary of Greek and Roman Biography and Mythology*, ed. William Smith, Vol. I (New York: AMS Press, 1967), pp. 920-924.

The botanical texts by Fuller, Evelyn and Browne shared a number of common characteristics. The trope of the pleasure garden, the expression of political discontent, the appeal for social harmony and the piety of the Anglican community, coupled with the lore of natural philosophy, associated all three writers with sequestered royalism. The display of scholarly learning by these authors also identifies them with the culture of educated and leisured gentlemen. While an enhanced concern with botanically-oriented texts may have made acceptable the close examination of plants within a specific community, it did not constitute the transition of natural history from virtuoso display to a scholarly undertaking. Nor do these texts represent a new disciplinary tradition in natural history. They remained part of the polite literature for a gentle audience.[53] However, by defining the pursuits acceptable within a social group, these texts also had the effect of making the study of plants a respectable gentlemanly activity. By 1660, it is possible to begin to identify specific scholarly works on plants within the royalist tradition.

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[50] It was common among Royalists to refer to the Interregnum government as unjust. John Evelyn, for instance, called the 1649 trials which sentenced Hamilton, Holland and Capel to death the "Rebel's new Court of Injustice"; *Diary,* Vol. II, 9 March 1948, p. 548.

[51] Browne, 'Dedication to Nicholas Bacon,' *The Garden of Cyrus,* sig. E, Ev.

[52] Browne, *Garden of Cyrus*, p. 64. My reading of *The Garden of Cyrus* is antithetical to that of Frank L. Huntley, who interprets the work as a millenarian prophecy of the second coming of Christ; Huntley, '*The Garden of Cyrus*' as Prophecy,' *Approaches to Sir Thomas Browne,* The Ann Arbor Tercentenary Lectures and Essays, ed. C. A. Patrides (Columbia and London: University of Missouri Press, 1982), pp. 132-143.

Botanical Literature and the Royalist Tradition

In the seventeenth century, books of natural philosophy or natural history did not belong exclusively to a specific genre of technical literature directed to a narrow, specialized audience, but were written for, and consumed by, a literate readership more generally. On this basis, John Ray's *Catalogus Plantarum circa Cantabrigiam*

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[53] For instance, the first biography of Robert Sanderson, Bishop of Lincoln (d. 1663), used an identical garden metaphor: "When [God] plucketh up the fairest and choicest flowers in his Garden, & croppeth off the tops of the goodliest Poppies, who can think other than he meaneth to lay his Garden waste, and to turn it into a Wild Wilderness? When he undermineth the main Pillars of the House, taketh away the very props and buttressses of Church and Commonwealth; sweeping away religious Princes, wise Senators, zealous magistrates, painful Ministers, men of eminent rank, gifts or example, who shall be secure tha[t] either church or commonwealth shall stand up long, and not totter at least, if not fall?" *Reason and judgement, or, Special remarques of the Life of the renowned Dr. Sanderson, late Lord Bishop of Lincoln together with his Judgement for settling the church, in exact resolutions of sundry grand cases very seasonable at this time* (London, 1663), sig. A3.

nascentium (Cambridge 1660) epitomizes the seventeenth-century understanding of the term 'literature' as humane or polite learning. Thus the work also stands as a display of polite scholarship in an environment favourably disposed to 'virtuosity' within gentle society.[54] The *Catalogus* included an *Explicatio nominum Authorum*, or historical account of "men famous for botanics in several ages" and a forty-seven-page *Etymologia* on the origins of words, making the book a perfect accompaniment for gentlemen scholars. Ray designated the audience of his *Catalogus* as "men of University standing to whom God has given leisure and a suitable education and intelligence," identifying Ray and his readers with the cultivated and cultured.[55] Indeed, Ray's decision to write the work in Latin effectively restricted his audience to the educated and gentlemanly class.

Ray's *Catalogus Cantabrigiam* may properly be seen as sharing the general characteristics of other post-civil war literature as a "way of giving shape and authority to the conduct of polemical argument."[56] An alphabetical listing of plants in and around Cambridge University, the work was researched and written in the politically charged decade after the civil wars and the execution of the King, and published immediately prior to the Restoration of Charles II in 1660. This work gives every appearance of being a celebration of the culture of sequestered royalism within the tradition of other royalist georgic texts, and Ray signalled this ambition in several subtle ways. The book was published anonymously, indicating that the content of the work was potentially controversial. The work emphasized themes ubiquitous to the royalist literature of the day: that is, concern with the company and friendship of men, the contemplation of pastoral pleasures, philosophical retreat and devotion to the study of God's creations.[57] The theme of plants, and its subsidiary theme of gardens, further recalled the emblems of peace and order associated with the gardens of the Stuart monarchy, and its political and artistic policies.

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[54] See especially Steven Shapin, '"A Scholar and a Gentleman": the problematic identity of the scientific practitioner in early modern England,' *History of Science* 29 (1991), pp. 279-327; and W. E. Houghton, Jr. 'The English virtuoso in the seventeenth century', *Journal of the History of Ideas* 3 (1942), pp. 51-72 and 190-219. For a perspective on fashioning the identity of natural history collectors in Italy, see Paula Findlen, *Possessing Nature*, pp. 293-345.

[55] John Ray, *Ray's Flora of Cambridgeshire (Catalogus Plantarum circa Cantabrigiam nascentium)*, trans. and eds. A. H. Ewen and C. T. Prime (Hitchen, Herts: Weldon & Wesley, 1975), p. 26.

[56] Zwicker, *Lines of Authority*, p. 10; and Potter, *Secret Rites and Secret Writing*, pp. 133-139.

Ray also made his political intentions explicit. In the 'Preface to the Reader,' his concern with botany is dated very precisely: nine years earlier when he had abandoned his university studies because of an illness of 'body and soul'.[58] As his audience would have been fully aware, this period exactly coincided with efforts of the Parliamentary visitors to impose on the Cambridge community the Engagement, Parliament's oath of loyalty to the regime constituted without King or House of Lords, and inevitably, also with the consequent ejection of nonsubscribing Fellows. Ray, who did not take the Engagement, left the University and returned only after selective enforcement had largely been abandoned.[59] Ray also acknowledged Trinity College as his intellectual home: a site of royalist support and occasional royalist activity during the civil wars.[60] Finally, in a gesture of gratitude, appreciation and tacit acknowledgement of the idealized Anglican community, Ray singled out two friends of respectable royalist background, Francis Willughby and Peter Courthope, for their outstanding culture, virtue and faith.[61]

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[57] Zwicker, *Lines of Authority*, pp. 16-17, 60-89; Potter, *Secret Rites and Secret Writing*, pp. 133-139.

[58] "*Cum nobis plurimum valedutinariis, corporibus animique causa.*" [Ray], '*Praefatio ad Lectorum*', *Catalogus Cantabrigiam*, sig. *3.

[59] Ray was appointed Greek Lecturer and did not return to the University 1 October 1651; Raven, *John Ray, Naturalist*, pp. xvi. The Engagement was not repealed until 13 January 1653/54, but enforcement was effectively discontinued in the fall 1651. In July 1651, William Sandcroft had been ejected from his fellowship for refusing to subscribe to the Engagement, but by 4 November, the Committee for Reformation of the Universities (via Sir Henry Mildmay) reported, that even the earl of Manchester, Chancellor of the University of Cambridge did not comply with the Act of Parliament in subscribing to the Engagement; J. B. Mullinger, *The*

Ray's *Catalogus Cantabrigiam* also has particular significance in the shaping of Restoration natural history. The work had been produced by the University of Cambridge printer John Field, and Field's stock of the text was subsequently purchased by Allestree and his partners in London. Already well known as booksellers to the 'wealthy and learned', Allestree and Martin were soon to be appointed printers to the Royal Society, and distribution of Ray's work to a wider community in London and especially to the emerging philosophical network was virtually assured.[62] Ray deployed several strategies for presenting his work as a trustworthy text. In particular, the *Catalogus* depicted the activity of natural history as politically and religiously disinterested by providing the appearance of philosophical neutrality. This strategy was accompanied by relocating botanical authority directly to the Anglican and Royalist community through exclusive appeal to a specific body of literature. These joint strategies not only provided a

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University of Cambridge, Vol III, From the election of Buckingham to the Chancellorship in 1626 to the Decline of the Platonist Movement (Cambridge: Cambridge University Press, 1911, rpt. 1969), pp. 391, 472.

[60] Mullinger, *The University of Cambridge*, p. 353.

[61] *"natalium spendore, ingenii sublimitate, suavitate morum, fide, virtue illustres,"* Ray, '*Praefatio ad Lectorem*', *Catalogus Cantabrigiam*, sig. *6.

[62] Worthington, *Diary*, p. 331; H R. Plomer, *Dictionaries of the Printers and Booksellers who were at work in England, Scotland and Ireland 1557-1775* (Yorkshire: The Bibliographical Society, rpt. 1977), Vol. II, p. 3.

prescriptive model for the correct presentation of natural history texts but had the additional effects of defining the proper attributes for natural historians and the proper knowledge of natural history. The *Catalogus* therefore functioned as a resource to correctly represent respectable past practice and as a model for reconstituting the activity as a legitimate expression of uncontentious and gentlemanly natural philosophy.[63]

I. Philosophical Neutrality

Adherence to a particular philosophical stance may also be an expression of political opinion. Discussions of the major intellectual commitments of seventeenth-century natural philosophers have dilated upon their adherence to conservative textual *scientia*, the new mechanical philosophies of Descartes and Gassendi or a radical, empirical approach to knowledge. However, during the Interregnum, each of these philosophical positions had potentially divisive political and religious implications. As a result, there was no single unproblematical, philosophical framework which enjoyed general consensus. To respond to the challenge posed by diverse philosophical commitments, Ray effectively presented his work as independent of theory.

Claiming to use only generally agreed upon technical terminology, Ray developed a Glossary, or *Terminorum quorundam* of botanical definitions and morphological terms.[64] The Glossary included definitions for such basic terms as *bulbus*, *calyx*, *fructu*s and *herba*, and for more esoteric words such as *internodium* (the place between two joints), *liber* (the innermost bark of a tree), *uculus* (a bud for inoculation). While this indeed supplied a more precise and technical language to communicate increasingly specialized material, this strategy also provided a standardized language which appeared to be free of contested meanings. The terminology implied a direct linkage with empirical observation, and therefore purported to represent a physical reality with which everyone could agree. By restricting plant descriptions to physical characteristics using a stipulated vocabulary, the final result gave every appearance of being 'neutral', disinterested', and 'objective'.

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[63] See for instance, Adrian Johns, *The Nature of the Book: Print and Knowledge in the Making* (Chicago and London: University of Chicago Press, 1998), pp. 320-325, for a discussion of how printers shaped their own cultural identity during this period of political change and social instability in England.

[64] [Ray], *Catalogus Cantabrigiam*, pp. 84-98. Ray compiled the definitions from several different sources and authors, including entries taken from an unpublished vocabulary of morphological terms developed by Joachim Jung, which he received from Samuel Hartlib, "*Joachimus Jungius Lubecensis in Isagoge Phytoscopica nondum edita nobia a Cl.Viro D. Samuele Hartlib communicata caulem its definit*" p. 87.

The strategy of designating a technical vocabulary also enabled Ray to avoid explicit reference to philosophical systems while at the same time endorsing traditional and conservative practices. Popular herbals of the early seventeenth century, for instance John Gerard's *Herball* (1597, 1633, 1634) and John Parkinson's *Theatrum Botanicum* (1640) and *Paradisi in Sole (1629, 1655)* were expressed in terms of Galenic medicine underpinned by Aristotelian philosophy and sanctioned by the universities and medical academies. Thus, from Gerard and Parkinson, we learn not only a plant's common physical description, its various names, time of flowering and where it grows, but also what the ancients said of its qualities, virtues and medicinal properties. For instance, we are informed that the herb thyme is a purgative for choler and phlegm, savoury is hot and dry in the third degree, and that mint has heating and drying qualities and is to be avoided by those with a choleric temperament.[65] In the *Catalogus*, however, Ray limited his report to a technical physical description, the locations in which he found the plant and other pertinent comments such as ecological dimensions or insect pests. Ray was scrupulous in observing humanist conventions of citing respectable authorities, and listing the names by which the plant could be found in other texts. Ray's conservatism however, should not be understood as implicit approval of scholastic textual practices, but rather was intended to preserve the commonly accepted traditions for the proper botanical texts.[66] Ray's more important intention was not to endorse a particular system of knowledge but to make philosophical neutrality a new convention.

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[65] John Parkinson, *Theatrum Botanicum: The Theatre of Plants* (London, 1640), pp. 6, 9, 36.

One of the hallmarks of the seventeenth century was an attempt to understand nature according to mechanical principles, a feature seen by many historians as crucial for the transition to modern science. There is no doubt that Ray was familiar with the mechanical philosophies, and indeed made direct reference in the *Catalogus* to promulgators of the 'new philosophies' such as Gassendi and Charleton. During the interregnum, however, the mechanical philosophy was identified as having the potential to advance atheism, and thereby posed a threat to the foundations of natural philosophy as the study of God's creations.[67] In defence of natural philosophy Ray advocated the study of nature and nature's processes precisely to achieve a more full knowledge and understanding of God and his attributes, and he reiterated the importance of natural philosophy in the *Catalogus* which was also written "to illustrate the glory of God in the knowledge of the works of Nature."[68] Ray's own concerns about the mechanical philosophy are evident in the 'Commonplaces' or morning exercises which he delivered at Trinity Chapel during these years. Later published as *The Wisdom of God Manifest in the Works of Creation*, this work was an extended argument against the utility of the mechanical philosophies for understanding vital activities.

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[66] See especially Karen Reeds, 'Learning Botany from Books', *Botany in Medieval Universities*, pp. 135-165. This aspect of Ray's work was seen as particularly beneficial; on 20 June 1660, John Worthington wrote to Samuel Hartlib "The mentioning the several names of one and the same plant in several Herbals, is of great use to the reader, as it was a work of labour to the composer." John Worthington, *The Diary and Correspondence of Dr. John Worthington*, ed. James Crossley, Vol. 1 (Chetham Society: rpt. 1968), pp. 330-334.

[67] See for instance Douglas M. Jesseph, *Squaring the Circle: The War between Hobbes and Wallis* (Chicago and London: University of Chicago Press, 1997); and Margaret J. Osler, 'The intellectual sources of Robert Boyle's philosophy of nature: Gassendi's voluntarism and Boyle's physico-theological project,' *Philosophy, science and religion in England 1640-1700*, eds. Richard Kroll, Richard Ashcroft, Perez Zagorin (Cambridge, New York, etc.: Cambridge University Press, 1992), pp. 178-198.

In the only explicit discussion of philosophy in the *Catalogus*, Ray attacked the popular doctrine of signatures and ridiculed the "foolishness of the chemists who chatter and boast so loudly." Invoking the entire corpus of his cited authorities, Ray claimed that "we have paid close attention to the matter and are moved to assert that the signatures are not indications of natural qualities and powers impressed on plants by nature."[69] The 'chemists' that Ray refers to are Paracelsians, who were seen to be ignorant of 'learned' knowledge, rejecting both scholastic and humanistic traditions of learning and revolting against established institutions. Seventeenth-century contemporaries associated radical experimental approaches to nature, and especially those advocating a Paracelsian chemical philosophy, with political and religious enthusiasts who were stigmatised as a leading cause of the Civil War.[70] The dangers posed by 'superstition, enthusiasm and atheism' appeared as very real threats during the period and thus the debate over enthusiasm was also a debate over political and philosophical choices.[71] The Cambridge Platonist Henry More, for instance, used the term 'enthusiasm' pejoratively: to designate those who believed themselves to be recipients of special divine communication, or who held extravagant or visionary religious opinion.[72] In fact More called enthusiasm a disease which could only be cured by the good Anglican virtues of reason, temperance and humility,[73] and explicitly associated "Enthusiasts" with Paracelsian doctrines.[74] Further, More directly equated enthusiasm with atheism for its potential to disorder and discord. The dangers posed by both "Atheism and Enthusiasme," More declared,

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[68] Ray, Preface to the reader, *Ray's Flora of Cambridgeshire*, p. 24.

[69] *Ibid.*, p. 110.

[70] Hugh Trevor Roper, 'The Paracelsian Movement', *Renaissance Essays* (London: Secker & Warburg, 1985), pp. 149-199.

> though they seem so extreamly opposite one to another, yet in many things they do nearly agree. For to say nothing of the joynt conspiracy against the true knowledge of God and Religion, they are commonly entertain'd though successively, in the same Complexion.[75]

More, and others, were involved with attacking false claims to knowledge and were concerned about the problem of how to discriminate true knowledge ~~and~~ and distinguish it adequately from the 'enthusiastic' knowledge of rebels and sectaries.[76] Ray entered into this debate by qualifying that valid knowledge was empirical, rational and universally accessible. Ray professed that God had created an orderly, harmonious and hence a law-like universe; in such case it must be possible to demonstrate God's harmony by "arguments drawn from the Light of Nature, and the Works of the Creation." True knowledge, Ray believed, would result from clearly demonstrable proofs "taken from Effects and Operations, exposed to every Man's view, not to be denied or questioned by any."[77] No unambiguous, unquestionable evidence existed to support the Paracelsian doctrine: "neither are the number of signatures so great nor the signatures they bear so obvious and plain to anybody that they suggest a pointer or deliberate plan on the part of nature."[78] Uncertain or private knowledge obtained from the 'inward illumination' of signatures would therefore be inadmissible in any system which aspired to provide accurate and demonstrable knowledge of nature.

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[71] Johns, *The Nature of the Book,* pp. 408-428.

[72] Derived from the Latin *enthusasta,* the designation of a sect of heretics in the fourth century who pretended to special revelation; *OED*, sv enthusiasm.

[73] Henry More, *Enthusiasmus Triumphantus or a Brief Discourse of the Nature, Causes, Kinds and Cure of Enthusiasm* (London, 1662), p. 36; see also Michel Heyd, "'Strange but Natural Effects" The Medical Critique of Enthusiasm in the Works of Meric Causaubon and Henry More', *"Be Sober and Reasonable": The Critique of Enthusiasm in the Seventeenth and Early Eighteenth Centuries,* Brill's Studies in Intellectual History (Leiden, New York, Koln: E. J. Brill, 1995), pp. 72-108.

[74] "[T]he rampant and delirous [sic] Fancies of that great boaster of Europe whose unbridled Imagination and bold and confident obtrusion of his uncouth and supine inventions upon the world has, I dare say, given occasion to the wildest Philosophical Enthusiasms that ever were broached by any either Christian or heathen;" More, *Enthusiasmus Triumphantus,* p. 33. An interregnum version was printed (1657), which has not yet been examined.

[75] Henry More, 'The Preface,' *Antidote against Atheisme,* 2nd edn (London 1653), sig. A.

[76] Johns, *The Nature of the Book,* p. 425.

Ray's strategy to present the *Catalogus* as a reputable botanical text was to distance himself from the contentiousness of either the Aristotelianism or Cartesian philosophies for understanding the world, but at the same time he attacked the philosophical system most closely associated with radical sectaries. Credit-worthy restoration authors of works on natural history similarly assumed the posture of philosophical neutrality, relying on an 'experimental philosophy' as probable knowledge based on the senses.

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[77] John Ray, 'The Preface,' *The Wisdom of God Manifest in the Works of Creation being the Substance of some common places delivered in the Chappel of Trinity College, in Cambridge* (London, 1691), sig. A7. Ray declared that the *Wisdom* was compiled from 'commonplaces' or morning divinity exercises which he had delivered in Trinity College while he was a Fellow of the College, which makes this a statement of Ray's opinions contemporary with the *Catalogus*. Ray also claimed that the work was partly in response to the professed knowledge of "Atheistical Persons, as inward Illuminations of Mind, a Spirit of Prophecy and foretelling future Contingents, Illustrious Miracles and the Like." In other words, the work was originally written, at least in part, as a response to 'Enthusiastic' knowledge.

[78] Ray, *Ray's Flora of Cambridgeshire*, p. 110.

II. Botanical Authority

By the time Ray wrote his *Cambridge Catalogus*, there was a well established scholarly tradition in England. Not only authors of herbals and catalogues of plants, but other scholars as well, identified their learned authorities, including ancient authors and recent European or English scholars. The English authorities cited by Ray clearly align him with a network of conservative botanists primarily associated with seventeenth-century institutions such as the Royal College of Physicians and the Society of Apothecaries. Most well known of the English authorities are John Parkinson and Thomas Johnson, but Ray also mentioned William Howe and Thomas (later Sir Thomas) Browne of Norwich. With the sole exception of a reference to Francis Bacon, Lord Keeper to James I and a prolific writer on natural history as well as natural philosophy, all of Ray's credible authorities were medical professionals. It would be commonplace to insist that Ray's identification of specific authorities aligns him to a scholarly tradition of botanical investigation and a recognized, respectable lineage of natural historians. By the 1650s, however, it was also a common strategy to draw attention to a shared political culture by identifying a recognized community of authorities who held similar convictions.[79] Ray's choice to align himself with this specific body of authorities thus established his affiliation with loyalist interests.

Parkinson (d. 1650) had been a founding member of the Society of Apothecaries, and officially known as the King's Herbarist. During the early seventeenth century, Parkinson had established a celebrated garden near London stocked with rare and exotic species of plants obtained from his extensive network of continental gardeners, plant hunters and colonists.[80] He is best remembered today as the author of two large and lavishly illustrated, (and therefore expensive) books, the medically-oriented *Theatrum Botanicum* (London 1640) and *Paradisi in Sole Paradisus Terrestris* which was wholly concerned with celebrating 'gardens of pleasure'. The *Paradisi*, originally published in 1629, was reprinted during the Interregnum, complete with Parkinson's original dedication to Queen Henrietta Maria, and there is no doubt that the work formed part of royalist strategy to reinforce their identity as a social community.[81]

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[79] Potter, *Secret Rites and Secret Writing*, p. 115.

The leading authority and most prominent expert in *res herbaria* during the reign of Charles I was the apothecary Thomas Johnson.[82] Immortalized for his bravery by Thomas Fuller in the posthumous *Worthies of England* (1662), Johnson had died in the "king's cause" during the civil war.[83] Perhaps best known for his 'correction' of John

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[80] John N. D. Riddell, 'John Parkinson's Long Acre Garden 1600-1650', *Journal of Garden History* 6(2) (1986), pp. 112-124.

[81] "Madam, knowing your Maiestei so much delighted with all the fair Flowers of a Garden, and furnished with them as farre beyond others, as you are eminent before them, this by Worke of a Gardon . . . seemed as it were destiend, to be first offered into your Highnesse hands, as of right challenging the proprietie of Patronage from all others".'John Parkinson, ' Dedication,' *Paradisi in Sole Paradisus Terrestris or a Choice Garden of all Sorts of Rarest Flowers, with Their Nature, Place of Birth, Time of Flowering, Names and Vertues to Each Plant Useful in Physic or Admired for Beauty*, The Second Edition much corrected and enlarged (London 1656).

[82] Johnson was cited in Ray's *Catalogus* as either Gerard *emaculatus* to bestow credit for Johnson's emendation of Gerard's *Herbal*, or as Dr. Johnson in recognition of the medical degree conferred on Johnson by the King at Oxford in 1641.

[83] Thomas Fuller, *Worthies of England*, ed. P. Austin Nuttal, Vol. III (London 1840), p. 422; *DNB*, Vol 10, pp. 935-936.

Gerard's *Herbal* (London, 1633, enlarged and corrected 1634), Johnson also had a separate identity as an author and a considerable reputation as a medical professional. Johnson had been a member of the Society of Apothecaries, and part of a network of royalists who were also concerned with botanical matters, including John Goodyer, Edward Morgan, Walter Stonehouse and George Bowles.[84] Under the auspices of the Society of Apothecaries, Johnson had supervised excursions to collect and record plants growing in English locales, and part of Johnson's reputation derives from printing the catalogues of these botanizing trips. Johnson may have intended a complete inventory of English plants before the civil war intervened, but in any event, the catalogues contained numerous plants previously unrecorded in Britain. What is more important, his catalogues introduced to England a practical format for the textual presentation of plants; a brief physical description was given, qualities and virtues were omitted, English names and some synonyms were included, and the particular observer and location of the plant were designated.[85] Thus when Ray also chose the stance of philosophical neutrality in his

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[84] Goodyer, also a friend of Parkinson, had collaborated with Johnson on the amended Gerard, and was first translator of Theophrastus from Greek into English. He is reported to have been a royalist and at Oxford with Charles I; R. T. Gunther, *Early British Botanists and their gardens based on the unpublished writings of Goodyer, Tradescant, and others* (New York: Kraus Reprint, 1971) esp. p. 65. Edward Morgan an apothecary, was associated with the physic garden at Westminster, a friend of both Johnson and William Howe, and had travelled with Johnson during a Wales botanizing trip; H. Wallis Kew and H. E. Powell, *Thomas Johnson: Botanist and Royalist* (London, New York and Toronto: Longmans, Green, 1932), pp. 93-94; Gunther *Early Botanists*, pp. 92, 292, 351-4; James Britten and George S. Boulger, *A Biographical Index of Deceased British and Irish Botanists* (London: Taylor and Jarvis 1893, rev. 1931), p. 220. Walter Stonehouse was a clergyman who had been deprived of his living during the interregnum; Gunther, *Early Botanists*, pp. 15,49,79, 82, 364, 271-3; Kew and Powell, *Thomas Johnson*, pp. 82-84, 94; Britten and Boulger, *A Biogaphical Index*, p. 290; A. G. Mathews, *Walker Revised: being a revision of John Walker's Sufferings of the Clergy during the Grand Rebellion 1642-60* (Oxford: Clarendon Press rpt. 1988), p. 28.

[85] Some European authorities, for instance Caspar Bauhin, had already introduced this practice on the Continent; if Johnson borrowed this method of reporting from Bauhin or others, he did not acknowledge it. Thomas Johnson, *Descriptio Itineris Plantarum Investigationis ergo suscepti in Argum Cantianium* (London, 1632); Johnson, *Mercurius Botanicus, sive Plantarum gratia suscepti Itineris* (London, 1634); Johnson, *Mercuri*

Catalogus Cantabrigiam, he was sustaining a practice introduced into England by the leading Royalist authority on plants.

The Oxford MD William Howe had also been active in the royalist interest during the civil war and had dedicated his catalogue of British plants, the *Phytologica Britannica* (London 1650), to the members of the Royal College of Physicians in London.[86] The catalogue, published the year after Nicholas Culpeper's first unauthorized translation of the College's official pharmacopoeia, has been described as 'giving every appearance of an official publication'.[87] The *Phytologica Britannica* was also remarkably similar both in format and content to Johnson's earlier presentation: although Howe included several plants undescribed by Johnson, explicit reference to medical virtues and qualities were omitted and additional members of the botanical community were identified.

Another member of the royalist network of botanists was Thomas Browne, who had been a correspondent of William Howe and claimed John Goodyer as "my worthy friend."[88] During the 1650s Browne's reputation as a royalist, a scholar and a gentleman had been enhanced by the publication of a number of scholarly works. In addition to the *Religio Medici* and *The Garden of Cyrus*, Browne's output included the *Pseudodoxia*

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botanici pars altera, sive Plantarum gratia suscepti itineris in Cambriam sive wallam descriptio (London,1641). Johnson translated the medical works of Ambrose Paré (1634), and the Paris Pharmacopoeia of Joannis de Boys (639), and was widely consulted for his medical expertise, listing for instance, Sir Henry Wotton among his clients; Kew and Powell, *Thomas Johnson*, pp. 89-90.

[86] Charles Webster, *The Great Instauration*, p. 319 who suggests that Howe's physic garden eventually became the nucleus of the Apothecaries Garden at Chelsea; Gunther, *Early Botanists*, pp. 199, 354; Kew and Powell, *Thomas Johnson*, pp. 106, 139; *DNB*, vol. 10, p. 102.

[87] Webster, *The Great Instauration*, pp. 267-271, 319; *DNB*, vol. 10, p. 102.

[88] Browne, 'Dedication', *Garden of Cyrus*, sig. E, "my worthy friend Goodier an ancient and learned botanist".

Epidemica or Vulgar Errors (1646) a critique of philological natural history, and *Hydriotaphia or Urn Burial* (1658) an antiquarian study.[89] In the *Catalogus* Ray made specific mention of the recently printed *Garden of Cyrus,* by "That Distinguished Gentleman, Dr. Thomas Brown"[90] and the two may have been acquainted as early as 1658.[91] In subsequent years and in his future works on natural history, Ray would acknowledge "the deservedly Famous Sir Thomas Brown, Professor of Physick in the City of Norwich," as his honoured friend.[92]

By 1670, there is little doubt that Ray had identified himself with a conservative tradition for the study of plants. That year marked the publication of his *Catalogus Plantarum Angliae*, which not only introduced Ray's generation of natural historians to the literature, but which also incorporated the individual contributions of the earlier royalist network.[93] We must assume that Ray's choice to enumerate specific individuals and recognize an identifiable tradition represented a deliberate and self-conscious identification with those interests. Conversely, the decision to exclude a body of literature and its associated community of herbalists must stand as a rejection of an alternate political and philosophical commitment.

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[89] Parry, *The Trophies of Time,* pp. 249-260; Andrew Cunningham, 'Sir Thomas Browne and his *Religio Medici*', *Reason, Nature and Religion: Medicine and Religion in Seventeenth-Century England*, ed. Ole Peter Grell and Andrew Cunningham (Cambridge: Cambridge University Press, 1997), pp. 12-61; *DNB,* vol. 3, pp. 64-72.

[90] Ray, *Catalogus Cantabrigiam,* p. 172, *'Per observavit clarissimus vir D. Tho. Brown MD. in auro libello Angl. Nuper edito, qui inscribitur Cyrus hortus vedebimus in Secali & Tritico."* Trans. 'But if you examine the matter more closely as that distinguished gentleman Dr. Thomas Browne, MD in his golden little book recently published entitled "The Garden of Cyrus" has observed, you will see that Rye and Wheat are not the only plants where the root and shoot break out simultaneously for in barley and oak they arise from the same seed point.'

[91] In 1658 Browne sent his 13-year-old son Edward, to Trinity College Cambridge where he is entered in the admissions register as a student of James Duport; W. W. Rouse Ball and J. A. Venn, *Admissions to Trinity College Cambridge,* Vol. 2 (London: Macmillan, 1911-16), p. 444. During the Interregnum, Ray, a former student of Duport, was an active Fellow of Trinity College, and held several appointments, including Tutor (1653-60) and Junior Dean (1658-9); Venn, *Alumni Cantabrigiensis,* Vol. 1, pp. 36, 232; Vol. II, p. 395.

[92] John Ray, 'The Preface' *The Ornithology of Francis Willughby* (London, 1678), sig. A4v.

[93] Although no correspondence exists, there seems little doubt that Ray and Goodyer had been in direct contact. [John Ray], *Catalogus Cantabrigiam Addenda et Emendanda* (Printed by John Field, Cambridge 1663), sig. 3v; "This plant [*Chamaedrys spursia*] (as I am informed by Mr. Goodyer) is figured and described by Fabius

A representative sample of authorities excluded from Ray's *Catalogus Cantabrigiam* must, of necessity, be selective. A comparison of contemporary authors who shared similar university or medical qualifications to pronounce authoritatively on plants emphasizes the legitimate choices available to Ray in this local context. During the Interregnum, an alternate repertoire of resources identified with parliamentary interests was rejected by Ray, including works by Nicholas Culpeper, William Coles, Robert Lovell, William Brown and Philip Stevens.

Nicholas Culpeper (1616-1654), a staunch parliamentarian, radical sectary, "Gent., Student in Physick & Astrologer" was also one of the most aggressive and prolific medical editors of the period. Culpeper and his disciples were responsible for forty-one editions of thirty different works between 1649 and 1660, including those of the British physician John Jonston, widely regarded as one of the contemporary authorities on the doctrine of signatures and a disciple of Comenius, the Puritan icon. Culpeper was also responsible for perhaps the most controversial work on plants during the Interregnum. The frequently reprinted *Pharmacopaeia Londoninensis or The London Dispensatory* was Culpeper's own unauthorized translation of the College of Physician's list of remedies. Undoubtedly

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Columna p. 238. The *Catalogus Plantarum Angliae* (London 1670) included a catalogue of plants from George Bowles, and recognized individual observations by "Doctor Johnson", Walter Stonehouse, George Bate, and Mr. Heaton, a correspondent of Howe.

a direct attack on the medical monopoly enjoyed by the College of Physicians in London, Culpeper not only made the work available in cheap printed editions, but advertised that his *Physical Directory* "will be very beneficial to all that understand not the Latin, or have not studied Physick for many years."[94] Culpeper also used the book as a vehicle to attack the Royalist medical establishment and its scholastic underpinning. In a sharp attack on the remedies of the Royal College of Physicians Culpeper lampooned,

> King James is their God,
> Harts-ease their Trinity.
> Their Divinity and Holiness is a couple of Plaisters.
> These twelve ingredients are their apostles.
> The College is in Amen Corner where they all sing Alleluia (Anglicae) together.
> Unless their Hand of Christ, which is made of Rose Water and Suger, help them
> I know not what will become of them.
> They have no other remedy to fly to, but their plaister called the Grace of God
> To see if that will help at a dead lift.[95]

This work in particular highlights the political associations that contemporaries themselves read into all literature of the period. It should not surprise us, therefore, that the *Pharmacopaeia* was lauded among Parliamentarians as predicting the inevitable victory of the "liberty of the subject."[96] At the same time, the work was violently attacked in the Royalist press as a threat to social order as well to physical well-being, "mixing every recept therein with some scruples, at least, of rebellion or atheisme, besides the danger of poysoning men's bodies."[97]

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[94] Nicholas Culpeper, Gent. Student in Physick & Astrology, *Pharmacopoeia Londoniensis or the London Dispensatory*, Printed by Peter Cole, Printer and Bookseller, at the Sign of the Printing Press in Cornhill, near the Royal Exchange (London 1659), Sig .*. 3.

[95] *Ibid.*, p. 304.

[96] Webster, *The Great Instauration*, pp. 267-271, 309-313; *DNB*, vol 5, pp. 286-287; Britten and Boulger, *Biographical Index*, p. 78.

Described as "the most famous Simpler or Herbarist of his time," William Coles (1626-1662) received his bachelor of divinity degree from New College Oxford and after the Restoration was secretary to Brian Duppa, Bishop of Winchester.[98] Coles attempted to identify his work with the legitimate interests, dedicating *Adam in Eden* (1657) to "the Commonwealth of learning, to the Colledge of Physicians, Chirurgions & Apothecaries; to the Court, to the Nobility & Gentry," declaring that members of the establishment would have approved of his project, had they but known of it. Coles however, claimed himself to be a "Good Commonwealths man" and designated an alternate network of parliamentarian authorities, who were "very eminent botanicks at the University of Oxford."[99] Both of Coles' popular botanical works, *The Art of Simpling* (1656, 1657) and *Adam in Eden* advocated the politically suspect Paracelsian doctrine of signatures. Although Ray's library holdings included both volumes, Coles nevertheless remained absent from Ray's roster of acceptable botanical authorities.[100]

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[97] *Mercurius Pragmaticus*, 4-9 September 1649, pt. ii, no 21, pp. 4-11.

[98] Anthony Wood, *Athenae Oxoniensis: An exact history of all the writers and bishops who have had their education in the University of Oxford*, ed. Philip Bliss, Vol. iii (London 1813, Facsimile rpt. 1969), col. 620.

[99] "And if I have failed the best of our English men, Mr. Good-yeare, Dr. Bowle, Mr. Ashmole, the intelligence of our late times, Dr. How, their assistance had not been wanting to mine endeavour, if my humble deserts could have raised me to the felicity and Honour of their Acquaintance." William Cole, *Adam in Eden*, Printed by J. Streater for Nathan Brooks (London 1657), sig. (a)2. Included among the Oxford herbarists were Philip Stephens and William Brown, discussed below, as well as Mr. Lydall, Mr. Wit, Mr. Hanley, Mr. Beetson and Mr. John Cross the Apothecary, none of whom was ever cited by Ray.

[100] *Bibliotheca Rayana: or a Catalogue of the Library of Mr. John Ray*, (London 1708), in *Sales Catalogues of Libraries of Eminent* Persons, ed. A. N. L. Munby, Vol. 11 (Mansell: Sotheby, Park, Burt, 1975), pp. 117-148; Blanche Henrey, *British Botanical and Horticultural Literature before 1800*, Vol. 1, Sixteenth and Seventeenth Centuries (London, New York and Toronto: Oxford University Press, 1975), pp. 88-90, rare volume not examined. The first printing of the *Art of Simpling* was dedicated to the Royalist Elias Ashmole but,

Robert Lovell (1630-1690) who attended Oxford "by favour of the visitors appointed by Parliament" was the author of *Pambotanica sive Enchiridion Botanicum* (1659, rept. 1665).[101] Lovell's philosophical orientation in this and in his *Panorktyoygia sive, Pammineralogicon* (1661) is clearly that of the doctrine of signatures, and among his own professed authorities are William Coles and John Jonston.[102] Lovell may have become a conforming Anglican after 1660, but his career as a natural historian ends with the publication of his *Pammineralogicon,* and he was never cited by Ray.

The Oxford Physic Garden at Oxford University had been established under the patronage of the royalist Lord Danby, and after Danby's death in 1643/44, the earl's estate had come under the control of his brother, Sir John Danvers, a Parliamentarian and regicide. In 1648, the gardener of the Oxford Physic Garden, Jacob Bobart, published a catalogue of plants from the garden. Ray possessed a copy of Bobart's Catalogue, revised and reissued William Brown and Philip Stevens in 1658. Stevens and Brown presented the list of plants as a scholarly work, which now provided Greek and Latin nomenclature and cited standard botanical authorities.[103] Ray chose not to acknowledge either author of the revised catalogue, and Steven's omission from Ray's botanical corpus

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according to Henrey, Ashmole objected and the second printing of 1657 omitted the dedication.

[101] Anthony Wood, *Athenae Oxoniensis,* vol iv, col. 296 and *Fasti,* vol. ii, Col. 160, 176; *DNB,* vol .12, pp.174-175.

[102] Robert Lovell, *Pambotanica sive, Enchiridion Botanicum, or a Compleate Herball, Containing the summe of Ancient and Moderne Authors, both Galenical and Chymical, touching Trees, Shrubs, Plants, Fruits, Flowers, etc. In an Alphabetical order: wherein all that are not in the Physic Garden in Oxford, are noted with Asterisks* (Oxford, 1659, 1665).

[103] Letter to Willughby, 25 February 1659/60; John Ray, *The Correspondence of John Ray,* ed. Edwin Lankester (London: Ray Society, 1848; rpt. New York: Arno Press, 1975), p. 2.

is noteworthy, since he had been a Fellow at Trinity in 1645, immediately prior to Ray's entry there. In 1653, Stevens had been made principal of Hart Hall at Oxford by the Parliamentary visitors, and in 1662 was ejected from his living at Willingham Cambridgeshire.[104] On the other hand, Steven's collaborator William Brown, a fellow of Magdalen College and later vice-president of the college (1669-1678), became an active contributor to Ray's Restoration works of botany during the 1670s.[105] Steven's omission and Brown's subsequent inclusion in Ray's work again implies selection on political grounds.

Conclusion

This chapter explored how natural history became associated with the legitimate activities of Anglican gentlemen during the post civil war period in England, and especially how the culture of natural history became one of the many expressions of royalist and Anglican allegiance during the Interregnum. Natural history had long been one of the fundamental approaches to the study of nature and an integral aspect of natural philosophy as it developed in early modern Europe. During the Interregnum, natural historical expertise also entered the domain of legitimate and respectable activities for Anglican gentlemen. The written culture of the period shows how natural historical knowledge could be used to promote a particular set of political and religious loyalties especially among royalist gentlemen. In particular, the literary form of the georgic became an established royalist trope, and functioned both as an expression of political discontent and as a celebration of Anglican piety, harmony and social cohesion. Exemplary texts by Robert Fuller, John Evelyn and Thomas Browne all associate a knowledge of plants with the lore of natural philosophy, the enjoyment of pastoral pleasure, and an appeal for social harmony as well as with widespread dissatisfaction for the prevailing political order.

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[104] Rouse Ball and Venn, *Trinity College Admissions*, part I, vol. 4, p. 156; A. G. Matthews, *Calamy Revised: Being a revision of Edmund Calamy's account of the ministers and others ejected and silenced, 1660-62* (Oxford: Clarendon Press rpt. 1988), p. 69.

[105] Wood, *Fasti*, vol. ii, col. 282; Gunther, *Early Botanists*, pp. 80. 278, 280, 292-293, 298-302; Raven, *John Ray, Naturalist*, pp.109, 150.

John Ray's *Catalogus Cantabrigiam* (1660), a narrow, technical work of botanical scholarship, shared many characteristics of post-civil war Royalist literature which used the genre of the georgic to express political discontent; its literary strategies also served to identify Ray with the Royalist community. One of the ultimate effects of the *Cambridge Catalogue* was that the scholarly study of natural history became associated with gentle learning, Anglican piety and royalist values. The politically-suspect doctrine of signatures disappeared as an organizing principle for botany during the Restoration, and natural historians with professed Parliamentary interests become invisible as authoritative models. Ray's noncommittal stance of philosophical neutrality became conventional practice in England, and the *Catalogus* provided the prescriptive model for proper natural historical and especially, botanical, texts in the future. The *Catalogus Cantabrigiam* defined what would henceforth be the proper method for communicating natural historical knowledge as a description of living nature based on the knowledge of the senses. Finally, Ray's *Catalogus* gave the appearance of being 'disinterested' and apolitical, a rhetorical tactic which became entrenched within the natural historical community, and a convention which embodied the respectable natural historian.

CHAPTER 3

"So many oathes and subscriptions"[1]
The Act of Uniformity, 1662

John Ray, Master of Arts,
Once Fellow of Trinity College in Cambridge,
Afterwards
A Member of the Royal Society in London;
And to both those learned bodies
An Illustrious Ornament
...
What more did add to these bright gifts, we find
A pure untainted Piety of Mind.
England's best Church engross'd his zealous care,
A truth his dying accents did declare

Translation of the Latin Inscription from Ray's Monument
Church of St. Peter and Paul, Black Notley, Essex[2]

The inscription on John Ray's tomb identified his alignment with three major institutions of late seventeenth-century England: the Royal Society, Trinity College Cambridge, and the Church of England. Of these, only Ray's attachment to the Church of England has ever been questioned, to the extent that Ray enjoys common fame as a Puritan among modern historians.[3] Ray's reputation as a Puritan rests solely on his decision not to subscribe to the Act of Uniformity, a political measure which disqualified numerous clergy and scholars from future participation in the affairs of the Established Church. It is therefore important to understand the precise events which led Ray to this choice. These contingent circumstances are especially relevant since scholarly discussion about Ray tends to interpret his activities prior to 1662 as the anticipation of an intolerant Church settlement, a development which was unforeseen until well after the election of the Cavalier Parliament in March and April 1661.[4] After that date, a proposed Bill for Uniformity was under discussion, but the shape and implications of the final act were uncertain even as late as May 1662.[5] It is clear from Ray's letters that he had been undecided about his future long before the effective date of the Act of Uniformity, St. Bartholomew's Day, 24 August 1662. What also emerges from this early correspondence is a lack of evidence that his actions were motivated by a Puritan 'tender conscience' in religious matters, although Ray also chose not to reveal his precise reasons for leaving Cambridge in 1662.

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[1] Letter to Courthope, 24 July 1662, Thompson, 'Some newly discovered letters", p. 119.

[2] Although age and weather has rendered the monument itself unreadable, the contemporary English translation of the entire passage continues to be displayed at Ray's Parish Church in Black Notley.

[3] Jeremy Gregory, 'Christianity and Culture: the Arts and the Sciences in England 1660-1800', *Culture and Society in Britain 1660-1800,* ed. Jeremy Black (Manchester and New York: Manchester University Press, 1997), pp. 102-123; M. E. Lazenby, *The Historia Plantarum Generalis of John Ray,* Unpublished PhD Dissertation (The University of Newcastle upon Tyne, 1995); Jo Gladstone, 'New World of English Words': John Ray, RFS, the Dialect Protagonist, in the Context of his Times (1658-1691), *Language, Self, and Society: A Social History of Language,* eds. Peter Burke and Roy Porter (Cambridge: Polity Press,

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1991), pp. 115-153; Christopher Hill, *The Experience of Defeat: Milton and some Contemporaries* (London: Faber and Faber, 1984), p. 20; Charles Webster, *The Great Instauration: Science, Medicine and Reform 1626-1660* (London: Duckworth 1975), pp. 84, 150-3; Robert K. Merton,'Science Technology and Society in Seventeenth Century England', *Osiris: Studies in the History and Philosophy of Science, and on the History of Learning and Culture*, vol. IV, part 2 (1938, rpt. New York: Howard Fertig, 1970), pp. 80-111. Barbara Shapiro appears to be the only recent historian to situate Ray as an Anglican and Royalist, *John Wilkin 1614-1672: An Intellectual Biography* (Berkeley and Los Angeles: University of California Press, 1969), p.143.

[4] For a discussion of the attempts at conciliation by the Restoration Government, see especially Ronald Hutton, 'The First Settlement', *The Restoration: A Political and Religious History of England and Wales* (Oxford: Clarendon Press, 1985), pp. 125-154; for the tendency to interpret Ray's subsequent decision in terms of a future uncertain (and unknowable) event, see for instance Roger Thompson, 'Some newly discovered letters of John Ray', *Journal of the Society for the Bibliography of Natural History* 7 (1974), pp. 116 n. 12, who suggests that as early as June 1661, Ray was concerned with staying at Cambridge because of the implications imposed by the Act of Uniformity.

[5] Hutton, *The Restoration*, pp. 173-176.

The Restoration and Religious Conformity at Trinity College, Cambridge

The return of Charles II to England in 1660 represented not merely the restoration of the monarchy, but also the restoration of the Established Church, Parliamentary government and a hierarchical social order. During the years 1660 to 1662, a series of measures designed to stabilize and maintain the authority of the new regime was enacted, including settlement of land claims, restraints on the press and what was intended to be an adequate financial settlement for the Crown. The period was also marked by an attempt on the part of the Crown to reconcile political divisions, and Charles balanced governance of the country between wartime loyalists and the old opponents.[6] Especially during 1660, Charles followed a similar strategy of religious reconciliation and was active in attempting to bring about a compromise settlement of the Church. Clergymen of varying religious viewpoints were presented to livings in the gift of the Crown and importantly, the divines nominated for bishoprics in 1660 were drawn from widely differing backgrounds including Arminians, Calvinists, 'Low-Churchmen', Commonwealth Conformists, and exiles, as well as those with few connections to either side.[7]

At the Restoration in 1660, Charles II had hoped for a comprehensive religious settlement and pursued a deliberately conciliatory policy toward Puritans in both church and state. Charles neither intended to impose a strict, conformist Anglicanism nor made ecclesiastical or Crown appointments which would bring about a uniformly conformist Anglican state. Nevertheless, the Church of England, in conjunction with a strongly Anglican Parliament, supported a series of legal measures to disable the participation of Puritans in society.[8] The Puritans, never a homogeneous group, became less visible as a force in society after 1660, not least because both contemporaries and historians have indiscriminately and interchangeably renamed them Presbyterians, sectaries, dissenters, nonconformists, occasional conformists and even papists, but also because many so-called Puritans were content to acquiesce in the return of the monarchy and declare loyalty to the Crown. Determined Puritan attitudes in religion and politics, however, persisted in England.[9] The infamous Clarendon Code had only variable success in reimposing Anglican conformity of practice on the nation; although significant numbers of recalcitrant clergy refused to conform to the Anglican order, there were still numerous, less-than-orthodox clergy who maintained their clerical positions.[10] Repeated attempts to remove dissenters from local governments and boroughs also suggests that Puritan groups were vigorous, persistent but also unwelcome, at least until Charles's remodelling of corporation charters in the 1680s.

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[6] For an account of Restoration policies and problems see especially John Spurr, *The Restoration Church of England 1646-1689* (New Haven and London: Yale University Press, 1991), pp. 30-42; and Hutton, esp. Section III, 'The Restoration Settlements,' *The Restoration*, pp. 125-184.

[7] I. M. Green, *The Re-establishment of the Church of England 1660-1663* (Oxford: Oxford University Press, 1978), pp. 30-31, 49-60, 90-91.

In September 1660, only six months after the publication of Ray's *Catalogus*

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[8] See especially Hutton, *The Restoration*.

[9] John Spurr, 'From Puritanism to Dissent, 1660-1700', *The Culture of English Puritanism 1560-1700*, ed. Christopher Durston and Jacqueline Eales (New York: St. Martin's Press, 1996), pp. 234-265.

[10] Hutton, *The Restoration*, pp. 143-147 and 176-177; Green, *The Re-establishment of the Church of England*, pp. 37-60 and 155-178; Paul Seaward, 'Gilbert Sheldon, the London Vestries and the Defence of the Church', *The Politics of Religion in Restoration England*, ed. Tim Harris, Paul Seaward and Mark Goldie (Oxford, Basil Blackwell, 1990).

Cantabrigiam, Cambridge was also adjusting to the restoration of the monarchy by a similar restoration of individuals deprived of their appointments during the Interregnum, in accordance with a Bill before Parliament for Confirming and Restoring Ministers. This measure was designed both to restore Anglican ministers who had been sequestrated under the Parliamentary regime and had legal rights to their livings, as well as to confirm the status of those clergy appointed during the Interregnum who nevertheless accepted the return of the King. Several thousand men who had been appointed to livings during the Civil Wars and Interregnum and who had acquiesced in the Restoration were confirmed in their titles when the Act was passed into law in December 1660.[11]

At Trinity College Cambridge, John Wilkins was replaced by a new Master, Henry Fern, who had been promised the Mastership by Charles I. Fern's first initiative at Trinity was to insist upon Anglican conformity within the College itself, which included prescribing the use of the prayer book and wearing the surplice in chapel.[12] Ray described the situation at Trinity in a letter to Peter Courthope in September 1660 where fourteen fellows and scholars were forced to withdraw during autumn 1660. The letter shows both Ray's own uncertainty at remaining a Fellow as well as his reluctance to accept conformity under coercion:

> Dr. Fern, who is made master of this colledge by C. R. [Carolus Rex?] having obtained a letter from the said C. R. to restore the old Fellows, and fill up the remainder of the fellowships with such of the new Fellows as should be found worthy, came down hither, about the beginning of August . . . and then forsooth readmitted all the new Fellows except Dr. Pratt, Mr. Disney, Scott, Davies, Senior, Long, White, Wilkes, Castle, West, Oddy; and, at that time, Hutchinson was also omitted, whom since, I hear, they intend to admit. I being

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[11] Hutton, *The Restoration*, pp. 130-131.

[12] *Further Correspondence of John Ray*, ed. R. W. T. Gunther (London, 1928), pp. 17-18.

> then out of town, and they having information that I should refuse the Common Prayer, surplice, &c., they had well near passed me by; but by the mediation of some, they were content to reserve my place, in case I would promise conformity. I wish they had spared themselves that trouble. About a month after that, I came hither, but am not as yet admitted; Dr. F[ern] hath been ever since out of towne. He returneth hither on Thursday next, they say, when I must expect my doome. I have long since come to two resolutions, namely, no promise of conformity, and no orders.[13]

In the autumn of 1660, conformity to the Anglican Church, and hence allegiance to the Crown, had been imposed on the Fellows of Trinity, but acceptability to the new regime at the College was prerequisite. In December 1660, acceptable appointments made during the Interregnum were secured by the Act for Confirming and Restoring Ministers. The fourteen scholars ejected in September 1660, who may also have qualified for reappointment at Trinity under the provisions of that Act, continued to be opposed as unacceptable to the College. Ray describes this situation in another letter to Courthope, which related "Mr. Senior & the rest who are confirmed by the late act, are opposed heer by our governors: so that if they intend to come in, they must be put to sue in Westminister hall, w[hi]ch Mr. Senior intends not to doe, because in case he should be reinstated, our Doctor [Fern] would in a short time cast him out again for nonconformity."[14]

Despite his protests to the contrary, Ray nevertheless chose to accept all the conditions stipulated by the College administration for remaining at Cambridge. In December of 1660, Ray made the decision to enter Anglican orders, and was ordained both deacon and priest on the same day by Robert Sanderson, newly appointed Bishop of Lincoln.[15] Ray was also reappointed to his office as Steward of the College and began the process of accepting new students. Thus, Ray's tenure at Cambridge with the approval of the College was not in question after December 1660. Ray's correspondence throughout 1661 however, continued to reveal indecision about remaining at Trinity. Only a few months after his ordination, Ray wrote again to Courthope with his intentions of leaving the university: "Yet still do I retain my purpose of discontinuing at the prefixed term, unless I have greater obligations then those to the contrary."[16] One week later Ray reported that John Gauden, formerly Dean of Bocking near Black Notley, and now "the B[isho]p of Exeter hath lately sent to me to take his son to be my pupill w[hi]ch I have not refused."[17] Given Gauden's own efforts to present himself as a loyal Anglican, it seems unlikely he would consider Ray a suitable tutor if there had been valid concerns about conformity.[18] In the same letter to Courthope, Ray also announced the death of his student Edward Goring, and reiterated, "This dismal event makes me far more willing to abdicate my pupils and knock them off, than before."[19] By November 1661, Ray was approaching the end of his appointment as college steward, with the opportunity to discontinue his fellowship voluntarily. He wrote, "My time is now ready to determine. In about a fortnight I shall give up my accounts, and then I hope to be at liberty, though I cannot certainly promise myself, for it may be they may continue me another year, which yet I desire not."[20] Despite his stated resolve to leave Cambridge, Ray again chose to remain at Trinity and was reelected Fellow in December 1661.

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[13] *Ibid.* Matthews also reports an entry in the Trinity Conclusions that "Mr. Ray have time till the 16th of October for ye making up his accounts of the Stewardship and giving his final resolution as to conformity. A. G. Matthews, *Calamy Revised: being a revision of Edmund Calamy's Account of the Ministers and Others Ejected and Silenced 1660-2* (Oxford: Clarendon Press 1934, rpt. 1988), p. 405; see also p. 181 sv Ekins. Calamy's later account even suggests that Trinity College was "peculiarly desirous to keep [Ray] in;" Calamy, *An Abridgement of Mr. Baxter's History of his Life and Times. With an Account of many others of those Worthy Minsters who were Ejected after the Restauration of King Charles the Second. Their Apology for Themselves and their Adherents, containing the Grounds of their Nonconformity, and practice as to Stated and Occasional Communion with the Church of England* (London 1727), p. 122.

[14] Letter to Courthope, 12 February 1660/6, Thompson, 'Some newly discovered letters', pp. 114-115.

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[15] Ray was ordained 23 December 1660 by Robert Sanderson bishop of Lincoln, a committed Calvinist and moderate Anglican, Raven, *John Ray, Naturalist: His Life and Works*, 2nd edn (Cambridge, etc.: Cambridge University Press, 1950, rpt. 1987), p. 59; Peter Lake, 'Serving God and the Times: the Calvinist conformity of Robert Sanderson', *Journal of British Studies* 27 (1988), pp. 81-116. Sanderson later became the subject of a "Life" by Izaak Walton, who had written the lives of four other eminent Anglicans: Richard Hooker, John Donne, George Herbert and Henry Wotton.

[16] Letter to Courthope, 5 June 1661, Thompson, 'Some Newly Discovered Letters', p. 115.

[17] *Ibid.*

[18] *Biographica Britannia*, Vol. 6, pp. 2177-2181.

Ray was not drawn to the prospect of a clerical living, his most obvious professional choice. As early as 1658 he had refused a living in Staffordshire, reluctant to "bid farewell to my beloved and pleasant studies and employments, and give myself up to the priesthood."[21] In October 1661 Ray declined another living and because of a gap in the correspondence we are left to speculate on the reasons for his decision; Ray's surviving correspondence only alludes to "those reasons you alleage" for the basis of his refusal although the living appears to have been attractive from a natural history perspective. Ray mused that "one great motive to have induced me to take it was, because of its vicinity to the Yorkshire Alpes, and especially Ingleborough Hill, which is not above sixe or seven miles thence distant. Indeed the whole countrey of Westmoreland, for variety of rare plants, exceeds any that I have travailled in England."

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[19] Letter to Courthope, 5 June 1661, Thompson 'Some newly discovered letters' p. 115; and *Further Correspondence*, pp. 18-19.

[20] Letter to Courthope, 26 November 1661, *Further Correspondence*, pp. 26-27.

[21] Letter to Courthope, 3 January 1658/59, *Further Correspondence*, pp. 16-17. At Cheadle in Staffordshire, this living was valued at £100 per year.

Yet, Ray indicated that he was dissatisfied with the income and "upon further inquiry, I find the yearly value to be lesse than it was at first represented." What is especially interesting about this letter is that Ray continued to discuss leaving Trinity and "to discontinue from the colledge as soon as I shall have made even my accounts therewith."[22] Therefore, by the end of 1661, Ray had accepted conformity to the Anglican Church, had been reappointed a Fellow of Trinity and held an office in the College. Simultaneously, he was unwilling to accept a clerical living, discontented at Trinity and indecisive about continuing at the University.

The Act of Uniformity 1662

In 1662, the newly elected parliament of Anglican gentry, hostile to the forces which had challenged their control over local society and anxious to reassert their authority, began to enact legislation to revive the Church of England and to fortify it against what they saw as the 'poisonous principles of schism and rebellion' engendered by religious heterodoxy.[23] The most important legislation was the Bill of Uniformity. The Bill was not designed to impose a set of theological beliefs on members of the Church, but to establish a uniform order of ritual and service, in the spirit of what Edward Stillingfleet, as Dean of St. Paul's, was later to plead "to those who continue in the Communion of our Church, let us walk by the same Rule and mind the same things. Let us study the Unity and Peace, and thereby the Honour and Safety of it."[24] The Bill of Uniformity would affect all clergy, school masters and university scholars, and it had four major stipulations: existing clerics who had not been ordained by a bishop must be so; all clergy must disavow armed resistance to the King; clergy must agree to follow the established order of the Church including the use of a newly revised Book of Common Prayer and subscription to the thirty-nine articles; and finally they had to repudiate the Solemn League and Covenant, the oath of loyalty to the Parliamentary regime. The eventual Act of Uniformity (1662), also known as the St. Bartholomew's Day Act, ultimately resulted in the ejection of approximately 1000 clergymen from their livings. Combined with earlier measures, close to 1750 individuals in total chose to relinquish their livings rather than conform to the Established Church.[25]

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[22] Letter to Courthope, 14 October 1661, *Further Correspondence*, pp. 22-23. The living was at Kirby Lonsdale, supposed to be worth £120 per year.

[23] *Ibid.*, pp. 179-180; and Spurr, *Restoration Church*, pp. 103-165.

In February 1662, a Bill for Uniformity was sent by the Commons to the House of Lords; however, its final shape was still uncertain as Clarendon continued to propose amendments which would enable the King to moderate or postpone the Bill. Also in February, the Privy Council formally submitted a revised Book of Common Prayer to the Lords which would later become contentious, but in 1662 appears to have been unequivocally acceptable to the Presbyterians.[26]

In April 1662, John Pearson, one of the clergymen responsible for the revision of the Book of Common Prayer and in fact the only cleric favourably reviewed by the Puritan leader Richard Baxter at the Savoy conference in 1661, replaced Henry Fern as Master of Trinity. Pearson, one of those clergymen who had been 'conspicuously loyal' to the King during the Interregnum, had also been a chaplain in the Civil War army of George Goring.[27] Given Ray's connections with the Goring family through the Courthopes and Burrells, it is no surprise to find him writing to Peter Courthope that Pearson "promises fair to doe me all the service he can. He can stand me in stead in no way that I know of but in the matter of pupills, which I have not put myself out of. Possibly I may resume that trade about Michaelmas next, when I shall have performed all my visits."[28] Even in late April 1662, Ray continued to contemplate a return to Trinity and apparently foresaw no problems doing so. At the same time, Ray was also considering other options for a future outside of Cambridge. In particular, he had been investigating with one of his former students, Thomas Hunt, the possibility of taking up positions at a private school together.[29]

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[24] Edward Stillingfleet, *The Mischief of Separation. A Sermon Preached at Guildhall Chappell May 11 1680* (London 1680), p. 45.

[25] Matthews, *Calamy Revised*, pp. xii-xiii. From Matthews, these figures represent 1760 individuals ejected from their clerical livings, 149 individuals ejected from the schools and universities, less 171 who later conformed.

[26] Hutton, *Restoration*, p. 175; and Spurr, *Restoration Church*, pp. 40-42.

In early May 1662, a seemingly carefree Ray visited Francis Willoughby at Middleton before embarking upon an extended tour of Wales and South West England. It was only after the Cavalier Parliament had passed the Bill of Uniformity into law on May

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[27] *DNB*, vol. 15, pp. 613-618; Matthews, *Walker Revised*, p. 347; Hutton, *The Restoration*, p. 175.

[28] Letter to Courthope, 28 April 1662, *Further Correspondence*, p. 28; and E. W. Gunther, *Early Science at Cambridge* (Oxford: Oxford University Press, 1937), pp. 374-375.

[29] *Ibid.* Thomas Hunt of Essex was admitted to Trinity as a Subsizar November 10, 1653, Matriculated 1653, BA 1657/58, MA 1661, tutor Mr. Wray; John Venn and J. A. Venn, *Alumni Cantabrigiensis*, Vol. 2 (Cambridge: Cambridge University Press, 1922-27, rpt. Kraus, 1974-76), p. 434; W. W. Rouse Ball and J. A. Venn, *Admissions to Trinity College Cambridge* (London: Macmillan, 1911-16), p. 428.

19, 1662[30] that Ray's deliberations about leaving Cambridge became more than speculative. On 24 July, he wrote to Courthope unhappy about the Act of Uniformity and opposed to the imposition of yet another oath: "I have already taken so many oathes & subscriptions as have taught me to disgust such pills."[31] Nevertheless, Ray was clearly apprehensive about his choice: "If I do not concoct this subscription, which I shall hardly prevail with my self to doe: & if I doe it will be certainly contrary to my inclinations and purely out of fear."[32] Despite the proximity of St. Bartholomew's day, his distaste for oaths and fear of the consequences were the only reasons Ray communicated to his closest friends for refusing to subscribe.

Shortly after August 24, the deadline for subscribing to the provisions of the Act, Ray wrote an emotional letter to Courthope but he again chose not to justify his decision. Rather, Ray continued to elaborate on his fears and anxieties about the potential consequences of nonsubscription. He wrote,

> August 24 has passed by now and I have not returned to Cambridge: consequently, the die is cast; behold I have been ejected from the fellowship [at Trinity] without any rights to return; for me, therein nothing more is [to be] sown or reaped; and I must seek a new way of life in some other direction. You and those like you, afflicted by similar circumstances, grant assistance to our [situation]; you are my only help and solace; you are the only consolation. I have not yet begun to regret [the decision], nor do I hope that I will regret it in the future. It is preferable to suffer; rather that than at last I now take on the role of a timid little man in the midst of so many snares,[33] whence there remains no hope, no manner of escape. I see

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[30] Hutton, *The Restoration,* p. 176.

[31] Letter to Courthope, 24 July 1662; Thompson, 'Some newly discovered letters", p. 119.

[32] *Ibid.*

[33] *Quod in tot laqueos timidus homuncio me jam jam induerim.* It is possible to translate 'homuncio' as homunculus, which was a phrase commonly used to designate 'little man' in the seventeenth century. In the early eighteenth century, Calamy complained that the Church party called Dissenters "that little kind of men". "Now, for their part, though they could see no reason for any great thoughts of themselves nor for expecting to be

> that I can be lacking in comrades more easily than I had hoped in my heart. This calamity held more fear in the beginning than in the retreat of my misfortune. Likewise whether I live nobly or obscurely begins to be up to me; truly even if, little by little, they withdraw who were believed to be my best friends; even if they forsake [me] an exile; even if my humility is shameful to you; even if (as Ovid once complained) "Shall I desert the damaged ship in the middle of the water?" I shall not lose my courage in any way because I can support myself so that my heart shall be well prepared. And indeed although I do not fear or look forward to anything of this sort (it would have been evil on the part of men of such faith, piety and virtue always having deserved the best from me) nonetheless if that should happen against all hope and expectation (may it be allowed me to conjecture and imagine this) I shall make effort not to succumb to such a great burden, and depend on the divine providence of the Supreme Father, the support of my household. I shall cover myself in my virtue and I shall seek a pious poverty as my gift.'[34]

After 1668 and John Wilkins' elevation to the see of Chester, it is possible that Ray had the opportunity to reconsider his earlier decision of nonsubscription to the Act of Uniformity. Among Ray's friends at Cambridge at least, there was a clear expectation that he would have a chance to reverse his stance. Ray's response was to persist in his reluctance to be an active participant in the Church and to continue to justify his voluntary absence from clerical office by an aversion to imposed oaths. Ray wrote to

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greatly thought of by others, they yet conceived, that as "little" as they were they had been of some use to the Government, and might be farther so. Though it was true enough they were but "little men," compared with some others." Edmund Calamy, *An Historical Account of my own Life with some reflection on the times I have lived in (1671-173)*, ed. John Towell Rutt (London: Henry Colburn and Richard Bentley, 1830), pp. 355-356.

[34] *Jam praeterit Aug. 24 necdum ego Cantabrigiensis reversus sum; jacta ergo est alea; sodalitio excidi sine postliminii spe ulla, mihi istic amplius nec seritur nec metitur, victus aliunde quaerendus est, tu tuique similes, afflictis rebus succurrite nostris, subsidium unicum, unicum estis soladium; me nondum incepti poenitet, nec in posterum spero poenitebit, illud potius dolendum, quod in tot laqueos timidus homuncio me jam jam induerim, unde evandendi nulla spes, nulla ratio superest. Video me posse carere sodalitio idque aequiore quam speraveram animo. Calimitas ista haec plus habet terroris in fronte quam in recessu mali. Spendid an obscure vivam mihi perinde esse incipit, verum quid si subducant sese paulatim qui amicissimi crediti sunt; si deserant extorrem; si humilitatis nostrae vos pudeat, si (quod Naso olim quaeritabat) "In mediis lacera puppe re linquar aquis"? Non demittam animum utcumque quoad possum annitar ut sit in omnem eventum bene preaparatum pectus. Et quamvis nihil tale subvereor aut auspicor quidem (nefas id esset de viris tantae fidei, pietatis, virtutis tum de me semper optime meritis) attamen si id praeter omnem spem et expectationem acciderit, (liceat hoc mihi fingere et imaginari), dabo operam ne tanto oneri succumbam penitus divina innixus providentia. Supremi Patris familias cura, "me virtute mea involvam, piamque pauperiem sine dote quaeram*". Letter to Courthope, 28 August 1662, *Further Correspondence*, pp. 30-31. I would like to thank Dr. Margaret Drummond, Department of History and Classics, University of Alberta, for her expert advice in the translation of this passage from the Latin. Some punctuation has been altered in my translation to make the passage more clear.

Martin Lister at St. John's College, Cambridge,

> Dr. Wilkins has been elevated to a bishop's chair, and for his own sake, and for mine, and especially for the interest of the Church, I rejoice strongly. Nevertheless for me to be reinstated to the Church through him is quite impossible in my present way of thinking. Nor indeed do I suppose it is possible for me ever to be persuaded to subscribe to the Declaration, a broad law which was inflicted upon Presbyterians and other ministers of the church not very long ago; and yet my deprivation is not so great as I shall be almost no use to the church, however (as the saying goes) I stand in open court.[35]

Historians have attributed Ray's refusal to take the oath as a conscientious choice; indeed, Charles Raven dedicated Ray's biography "to all who like John Ray have sacrificed security & career for conscience' sake."[36] Claiming an undefined 'tender conscience' as Ray's grounds for refusing to take the oath stipulated by the Act of Uniformity would clearly situate him in the tradition of Puritan dissent. Matters of conscience were explicitly designated by the Anglican Church as illegitimate reasons for refusing to conform. Robert Sanderson, while Bishop of Lincoln, had directly addressed the question "how far we may indulge good and godly men of tender consciences dissenting from us in liberty of Conscience."[37] Sanderson, however, was determined in his opposition to Puritanism[38] and unequivocal in his denunciation of conscience as a valid reason to refuse lawful authority.[39] In subsequent years, Edward Stillingfleet, according to Ray "one of the most learned men of our time,"[40] was even more forceful in denying validity to reasons of conscience. Despite what were intended to be attempts to comprehend differences in religious opinion within the Church, Stillingfleet maintained "The scruple of conscience is *no* protection against Schism; no cause of Separating; nor doth it take off causeless Separation from being Schism."[41] While natural philosophers were concerned with the possibility that the senses could lead men into error, Stillingfleet in addition worried about those conclusions "which may arise from errors of conscience as well as carnal and corrupt reason." Like Sanderson, Stillingfleet continued to conclude that conscience was an unreliable guide to action: "Men ought not to rest satisfied with the present dictates of their Consciences, for notwithstanding them, they may commit very great sins. I am afraid, the common mistaking the Case of an Erroneous Conscience hath

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[35] Letter to Lister, 31 October 1668, *The Correspondence of John Ray*, ed. Edwin Lankester (London: Ray Society, 1848, rpt. Arno Press, 1975), p. 30. "*D. Wilkins in episcopalem cathedram erectum, et sui-ipsius, et mei, et praecipue ecclesiae causa vehementer gaudeo. Me tamen per eum ecclesiae restitutum iri stante sententia, plane est impossibile, nec enim unquam adduci me posse puto ut declarationi subscribam quam lex non ita pridem lata presbyteris aliisque ecclesiae ministris injungit, nec tamen tanti est jactura mei qui nulli fere usui ecclesiae futurus essem, utut (quod dici solet) rectus in curia starem.*"

[36] Raven, ' Dedication', *John Ray Naturalist*.

[37] Robert Sanderson, *Judgement for the Settling of the Church* appended to D.F., *Reason and Judgement or Special Remarkes of the Life of the Renowned Dr. Sanderson, Late Lord Bishop of Lincoln* (London, 1663), p. 45. It was claimed that Charles I declared, "I take my conscience to Sanderson", and to have corrected the English translation of Sanderson's *De Juramento* (Seven lectures concerning the obligation of promissory oaths) while in custody of the Parliamentary forces, published at London in 1655. Robert Boyle apparently became Sanderson's patron after reading *De Juramento;* Izaak Walton, *Life of. Robert Sanderson*, (London 1678, rpt. London 1899), pp. 298-299; 316-317. Ray also possessed several of Sanderson's works, including a 1678 edition of *De Juramento* as well as Izaak Walton's *Life of Dr. Sanderson* (London, 1678) to which the *Judgement for Settling the Church* was also appended. See *Bibliotheca Rayana: or a Catalogue of the*

Library of Mr. John Ray, Late Fellow of the Royal Society (London, 1708), ed. A. N. L. Munby, *Sales Catalogues of Libraries of Eminent Persons*, Vol. 11 (Mansell: Southebey, Parke, Burt, 1975).

[38] Lake, "Serving God and the Church", p. 113.

[39] "Of which *scruples* it behooveth every man ... [to] resolve to go on according to the more *profitable perswasion* of his mind, and *despise* those scruples, And this he may do with a good conscience, not only in things *commanded* him by lawful *authority*, but even in things *indifferent* and arbitrary, and wherein he is left to his own *liberty;* Sanderson, *Judgement*, p. 92.

[40] John Ray, *Wisdom of God Manifested in the Works of Creation*, 4th edn (London 1704), Sig A6.

[41] Stillingfleet, *The Mischief of Separation, A sermon Preached at Guildhall Chappell May 11, 1680* (London, 1680), p. 40. In 1691 Ray listed Stillingfleet as one of the most learned men of the day. He also owned several volumes of Stillingfleet's sermons as well as Clarendon's defence of Stillingfleet; see *Bibliotheca Rayana.* Ray and Stillingfleet may have been acquainted: not only were they contemporaries at Cambridge (Stillingfleet was admitted to St. John's in 1649, became a fellow there in 1653 and received his MA in 1656) but was also dean of St. Paul's during the tenure of Ray's good friend, Henry Compton, Bishop of London.

done a great deal of mischief to conscientious men."[42]

In 1662, Ray would have had an extensive repertoire of arguments available to plead the cause of conscience had he chosen to justify his refusal in these terms. The nonconformist grounds for refusing the oath were widely reported after 1662, but close examination of his writings provides no evidence that Ray appealed to this literature. Nor did he appeal to the Anglican tradition where justification for refusing oaths had been well rehearsed during the Interregnum, and as an 'interested party' we would expect Ray to be well aware of this literature. Especially during the 1650s Anglican loyalists had pleaded matters of conscience for refusing the Solemn League and Covenant which Ray as a student would not have been required to take. Ray may have read John Barwick's 1647 description of the hazards of life at Cambridge after the defeat of the King and the 'righteous' refusal to take the Covenant: "Thus we are imprisoned or banished for our consciences, being not so much as accused of anything else, but only suspected of Loyaltie to our King, and Fidelity to our Mother the Church of England."[43] It is likely that Ray had read Thomas Fuller's, *History of the University of Cambridge* (1655) which recounted the refusal of many at Cambridge to take the Parliamentarian Oath of Discovery, an instrument to discover those who had not taken the Covenant, and which Fuller claimed was "against all law and conscience."[44] Undoubtedly, Ray was familiar with the writings and reputation of Robert Sanderson and in his final confession, Ray reminded his auditors that he had chosen to be ordained by "Dr. Sanderson, then Bishop of Lincoln."[45] Sanderson, whose epitaph read "Here lies Conscience enshrin'd" had led the Oxford University dons in their refusal to subscribe to the Solemn League and Covenant in 1646, and been imprisoned for his loyalty to the Crown during the 1650s. Well known for advising on the 'resolution in cases of Conscience' during the Interregnum, Sanderson had also published his Oxford Lecture, *De Obligatione conscientiae.*[46] Ray's personal library included the fourth edition of Sanderson's *34 Sermons* as well as his frequently printed *De Juramento, Seven Lectures concerning the Obligation of Promissory Oaths* (London, 1655) first published in Latin in 1647, but later "translated into English by his Late Majesties special command, and afterwards revised and approved under his Majesties own hand."[47] Ray's decision not to subscribe to the Act of Uniformity also follows Sanderson's admonition to avoid unnecessary oaths, refuse unlawful ones, and accept only those oaths legally required. Sanderson's *de Juramento* had advised,

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[42] *Ibid.*, pp. 40, 43.

[43] [John Barwick] *Querela Cantabrigiensis: or, A Remonstrance by way of Apologie for the Banished members of the late flourishing University of Cambridge* (London, 1647), p. 26.

[44] Thomas Fuller, *The History of the University of Cambridge from the Conquest, London 1655*, eds. Marmaduke Prickett and Thomas Wright, AD 1642-1643 Charles I (Cambridge and London: Cambridge University Press, 1840), p. 320. Ray's personal library contained both Thomas Fuller's *Worthy's of England*

(London 1662) and Fuller's *History of the Holy Wars* (Cambridge, 1652); *Bibliotheca Rayana*, p. 21.

[45] Rev. Mr. Pyke, "Mr. Ray's Dying Words", *Philosophical Letters of John Ray*, ed. William Derham (London 1718), p. 374.

[46] Ja.H. *An Elegy on the Much Lamented Death of Dr. Sanderson, Late Lord Bishop of Lincoln* (London, 1663); D. F. *Reason and Judgement: or special remarques of the Life of the Renowned Dr. Sanderson, late Lord Bishop of Lincoln. Together with his Judgement for settling the Church; in exact resolution of sundry grand cases very seasonable at this time* (Oxford, 1663); Izaak Walton, *The Life of Dr. Sanderson, Late Bishop of Lincoln* (London 1678 rpt. London, New York, Toronto, Oxford University Press, 1956); *DNB* vol 17, pp. 754-755.

[47] Ray's copy of *De Juramento* was dated 1676. Ray's library also included a number of works we would expect to find in the library of a loyal Anglican, such as the Book of "Common Prayer neatly Bound in Turkey-leather, with the Cuts finely colour'd, work'd off with small Tools", *Archbishops Laud's Remains, writ by himself* (1700), and George Herbert's *Sacred Poems* (1643); see *Bibliotheca Rayana.*

> Wherefore Men, Fathers and Brethren, I beseech you as many as are here present, and all wherever they be, who wish well unto the publique peace of this Church and kingdom, or to the private of their own souls, and Consciences, that we take the most diligent heed, lest we fall into contempt of God's most holy Name, and violation of our own faith; that we flye all unnecessary Oaths, constantly refuse those which are unlawfully required, faithfully perform those which we have lawfully taken, as far as in our power, courageously restrain the licentiousness of sin in oaths.[48]

It is true that many of those disqualified by their refusal to subscribe to the Act of Uniformity as a matter of conscience may have formed the clerical nucleus of dissenting churches in the later seventeenth century. It is clearly not the case that all who refused the Act of Uniformity did so to pursue their religion within the nonconformist tradition.[49] Many who chose not to comply with the Act quietly conformed to the Church but retired from active participation in religious affairs with few or no disabilities caused by their action. Among Ray's immediate friends and associates for instance, Edward Hulse left Cambridge to take up medicine at Leyden, and later became a physician at the court of William of Orange at the Hague.[50] Perhaps equally typical were those who withdrew from pastoral duties, yet whose sons became Anglican clergy. In 1662 William Grace, father of Ray's students at Trinity, Robert and Job Grace, was ejected from his living as Vicar of Shenstone, Staffordshire and was briefly active in the dissenting tradition. Both of William's Cambridge-educated sons became Anglican clergy, and Robert succeeded his father in the living at Shenstone. Two of William's other sons were educated by

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[48] Robert Sanderson, *De Juramento, Seven Lectures concerning the Obligation of Promissory Oaths. Read Publickly in the Divinity School at Oxford. By Robert Sanderson D.D., His Majesties Public Professor there. Translated into English by his Late Majesties speciall command and afterwards revised and approved under his Majesties own hand* (London 1655), pp. 271-272.

[49] See especially John Spurr, 'From Puritanism to Dissent', pp. 234-265.

[50] *DNB*, vol. 10 p. 203; Venn and Venn, *Alumni Cantabrigiensis*, vol. 2 p. 429; William Munk, *Roll of the Royal College of Physicians*, vol. 1 (London: The College, 1878), pp. 397-398.

Archbishop Sheldon.[51] Ray's contemporary at Cambridge and neighbour in Essex, Richard Courtman, was also deprived in 1662 but turned to the practice of medicine. Three of Courtman's sons became Anglican clergymen, including Mansell, later one of Ray's friends and contributors. Richard Kidder, another friend and fellow Cantabrigiam, also suffered deprivation in 1662 and later conformed with no apparent penalty. Kidder was appointed Rector of Rayne near Black Notley in 1664, and later Bishop of Bath and Wells.[52]

If Ray did not leave the University as a matter of conscience, there nevertheless may have been other reasons for him to find Restoration Cambridge uncongenial, as did many of his contemporaries who also chose to withdraw from the University between 1660 and 1662. This number included several who became prominent in the Restoration church such as John Tillotson and John Tenison, both of whom became Archbishops of Canterbury, and Edward Stillingfleet, subsequently Bishop of Exeter. Simon Patrick, later one of the leading devotional writers of the Restoration church and successively Bishop of Chichester and Bishop of Ely, also chose to leave Cambridge and academic life as a result of an incident regarded at the time as an example of royalist reaction at the University. Patrick had been elected Master of Queens by a majority of Fellows but in opposition to a Royal nominee. In the ensuing controversy the Vice-Chancellor was instructed to form a commission to suspend the disobedient fellows and Clarendon designated Patrick a

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[51] Matthews, *Calamy Revised*, p. 230.

[52] Kidder was at Cambridge1649-56, *Ibid.*, pp. 138-139, 231; Venn and Venn, *Alumni Cantabrigiensis*, Vol. I pp. 405-406; *DNB*, vol. 11, pp. 96-98; *Biographica Britannica*, vol. 4, pp. 2837-2839; John Ray, *A Collection of English Proverbs*, 2nd edn (London, 1678), sig. A3v; John Ray, *A Collection of Unusual Words*, 2nd edn (London, 1691), sig. A5v.

'factious fellow'.[53] In a letter written the first week of May 1662, (and prior to passing of the Act of Uniformity in Parliament), Ray commented on this disruptive event at Queens and alluded to the tensions between the Restoration fellows and the Interregnum scholars: "the junior fellows would have chosen Mr. Patrick of my year, a deserving person & one that wants nothing but years to qualify him for such a preferment. The old & new University will never kindly mingle or make one piece."[54] Other divisions at Cambridge among those of the "prelatical Spirit," the "hide-bound, strait-lace'd spirit" and those "whose fortune it was to be borne late, as to have their education in the University, since the beginning of the unhappy troubles of this Kingdome" were also described in 1662, possibly by Patrick himself.[55]

Ray may also have been dissatisfied with the intellectual climate being promoted in Restoration Cambridge by the returning scholars. During the interregnum, Ray had been part of a broad company of scholars active in pursuing a variety of approaches in natural philosophy, including animal dissections and chemical experiments, as well as Ray's own botanical enterprise.[56] Especially after John Wilkins' appointment as Master of Trinity in 1659, Ray belonged to a circle which included Isaac Barrow as well as Henry More and

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[53] See Gascoigne, *Cambridge in the Age of Enlightenment*, pp. 33-36 for further details on this incident.

[54] Letter to Courthope, early May 1662, Thompson, 'Some Newly Discovered Letters", p. 118; Gunther, *Further Correspondence*, p. 29. Ray's comment forms part of the evidence used to describe the disruptive atmosphere at Cambridge after the Restoration; see Gascoigne, *Cambridge in the Age of Enlightenment.*

[55] S[imon] P[atrick], *A Brief Account of the New Sect of Latitude Men: Together with some reflections upon the new philosophy, by Sp> of Cambridge* (c. 1662).

[56] John Worthington letter to Samuel Hartlib, 10 June 1661, *The Diary and Correspondence of Dr. John Worthington*, ed. John Crossley Esq., vol. 1 (Chetham: Chetham Society rpt. 1968), pp. 330-334; see also Raven, *John Ray, Naturalist*, pp. 44-51; and Webster, *The Great Instauration*, pp. 150-153.

Ralph Cudworth, the Cambridge Platonists who introduced the atomic natural philosophies of the Greeks and Descartes to the University. Many of the newly appointed or restored scholars after 1660 may have been unsympathetic to innovation and novelty in natural philosophy. John Pearson, Ray's Master at Trinity at the time of the Act of Uniformity, was a noted scholar in the scholastic tradition and advocated training students in the conservative, textual *scientia* of the Schoolmen. In his inaugural lecture as the Lady Margaret's Professor of Divinity, Pearson proposed returning to the thirteenth-century methods of St. Thomas Aquinas.[57] Some years later, Ray alluded to the philosophical struggle at Cambridge in the preface to his *Synopsis methodica stirpium Britannicarum* (London 1690).

> I am full of gratitude to God that it was His will for me to be born in the last age when the empty sophistry that usurped the title of philosophy and within my memory dominated the schools has fallen into contempt, and in its place has arisen a philosophy solidly built upon a foundation of experiment: against it elderly professors protest and struggle in vain; they are men who when fruit has been discovered prefer to live on acorns for fear they should be constrained 'to lose in age the lessons of their youth' and acknowledge that they have wasted their lives following the shadow of philosophy and embracing a wraithe instead of the Queen of Heaven.[58]

There may also have been positive reasons why Ray chose to leave Cambridge. In July 1662, Ray's correspondence made reference to a proposed continental tour with Francis Willoughby, a route that was undoubtedly attractive to Ray. The comment that "Mr. Willughby is still intent upon his transmarine expedition & will I believe, solicit you for your company" suggests that the excursion had been under discussion among Ray's circle for some time.[59] While this final letter before St. Bartholomew's day expressed apprehension about leaving Trinity, it was also decidedly optimistic about his immediate future prospects. "I doubt not" Ray wrote "but I shall be some way or other sustained, & it may be more to my satisfaction then if I should swallow the Declaration & continue still in Trinity College."[60] One week later, Ray announced to Courthope that he had engaged himself to Robert Barham.[61] Barham, with whom Ray would correspond for several more years, had been imprisoned as a suspected Royalist during the civil wars, was a member of the Cavalier Parliament and Justice of the Peace as well as Deputy Lieutenant for Kent.[62] Shortly thereafter, Ray announced a position with Thomas Bacon at Friston Hall, Suffolk which would occupy him until the proposed European tour commenced in March at which time "I may then be free to wayte upon Mr. Willoughby."[63]

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[57] Mullinger, *History of Cambridge*, vol. 3, p. 587; *DNB*, Vol. 15, pp. 613-618; and Gascoigne, *Cambridge in the Age of the Enlightenment*, pp. 27-68. Gascoigne reports that both More and Cudworth, while continuing at Cambridge, nevertheless also suffered after the Restoration for their alleged lack of loyalty to the Crown for remaining members of the University during the Interregnum.

[58] Ray, Preface, *Synopsis Methodica*, translated by and quoted in Raven, *John Ray, Naturalist*, p. 251.

In 1690, with his reputation as the 'foremost botanist of the age' secure, and his fame as spokesman for 'rational piety, sound philosophy and solid instruction' still in the future, Ray offered a private retrospective justification for his decision in 1662 to his former pupil at Trinity, Timothy Burrell, "You may remember that [th]e rigorous exacting from all that were admitted to any office or employment in [th]e Church such oaths or subscriptions as my scrupulosity would not permit me to take, excluded me from the exercise of the ministerial function, to w[hi]ch I was by my education designed and had also actually engaged myself in."[64] Ray's use of the term 'scrupulous' may have been understood in terms of our twentieth-century definition of scruples, referring to actions directed by the dictates of conscience, and characterized by a strict and precise regard for what is right.[65] In the seventeenth century, however this reading was not common. To be scrupulous was primarily understood as to be concerned with or troubled by doubts, anxiety or fear.[66] In this sense, Robert Sanderson had considered the scruples, or doubts, of conscience. "What is to be done" Sanderson asked, "when the conscience is *scrupulous*? I call that a scruple, when a man is reasonably well perswaded of *the lawfulness* of a thing, yet hath withal some *jealousies* and *fears*, lest perhaps it should prove unlawful."[67] Ray's own response to the Act of Uniformity had been one of fear and doubt, and his private letters consistently implied the meaning of scruples in this sense of the word.

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[59] Letter to Courthope, 24 July 1662, Thompson, 'Some newly discovered letters', p. 119.

[60] Letter to Courthope undated, but believed to be 13 August 1662, *Further Correspondence,* pp. 25-26; Gunther, *Early Science in Cambridge,* pp. 376-77.

[61] ". . coming over hither on purpose to see me, and making a strong invitation to Bacton, I could not avoid to engage myself to wait upon him." Letter to Courthope, 28 August 1662, *Further Correspondence*, pp. 30-31.

[62] B. D. Henning, *The House of Commons 1660-1690,* vol. 1 (London: History of Parliament Trust, 1983), pp. 599-600; Ray, *Correspondence of John Ray, consisting of selections from the Philosophical Letters published by Dr. Derham*, ed. Edwin Lankester (London 1848, rpt. New York: Arno Press, 1975), pp. 9-10; *Further Correspondence*, p. 116; Raven, *John Ray, Naturalist,* pp. 65, 130, 147.

[63] Letter to Courthope, 4 September 1662, *Further Correspondence*, pp. 32-33. As it turned out, Ray was than happy with his tenure at Friston. See letter to Courthope January 1662/3,Thompson 'Some newly discovered letters' p. 120; *Further Correspondence*, p. 32-33; Gunther, *Early science in Cambridge* p. 346-347. Bacon had been active in Cromwell's parliament of 1654, and in 1648 was a Presbyterian Elder in the Sarmundon Classis; Henning, *The House of Commons*, vol. 1, p. 581.

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[64] *Ibid.*

[65] *OED*, sv scruples, (4).

[66] In terms of being troubled with doubts or scruples of conscience, see especially *OED* sv scrupulous 1(b): prone to hesitate or doubt, distrustful, cautious or meticulous in action, deciding, etc. characterized by doubt or distrust.

[67] Robert Sanderson, *Judgement for the Settling of the Church* (London, 1663), appended to D.F., *Reason and Judgement or Special Remarkes of the Life of the Renowned Dr. Sanderson, Late Lord Bishop of Lincoln* (London, 1663).

Conclusion

Judgement of Ray's religious identity has been contested by modern historians on the basis of his choice to refuse subscription to the Act of Uniformity. None of Ray's letters written in the summer of 1662 addressed his reluctance to subscribe to the Act of Uniformity, other than to express a distaste for oaths and fear of the consequences arising from his decision. It is also important to emphasize that in the months and years prior to St. Bartholomew's Day 1662, Ray had displayed consistent reluctance either to become a clergyman or to remain at Cambridge where he found the 'old' and the 'new' at Trinity to be an uncomfortable combination. Ray may also have had positive reasons for choosing to leave Cambridge in 1662 and the attractions of travel and other secular activities may have appeared irresistible to an individual who had already spent more than half of his life at the university. Further, a refusal based on Ray's avowed distaste for oaths would have been fully consistent with his earlier refusal of the Oath of Engagement when he withdrew from Cambridge until the selective enforcement of the Engagement had been abandoned. In summary, there is no contemporary evidence whatsoever to situate Ray within the Puritan tradition and there is no evidence that Ray justified his own actions in terms of a matter of scruples of conscience within either the prevailing Anglican or Dissenting framework. Furthermore, the prevailing historiography has made it difficult to explain Ray's influence and prominence within the royalist and Anglican context of Restoration England.

It is also unnecessary to insist upon an explanation which privileges a nonconformist 'tender conscience' to explain Ray's choice to refuse subscription to the Act of Uniformity. The decision to quit Cambridge and the scholarly life could not have been made frivolously, and Ray certainly would have faced a much more uncertain and insecure future as a result of his actions. This decision however, also provided an opportunity for Ray to engage in his "beloved and pleasant studies and employments"[68] on his own terms. In order to explain Ray's success in stabilizing the enterprise of natural history in subsequent years, I have reassessed Ray's political and more particularly his religious reputation as a Puritan. In particular, I argue that Ray himself held Anglican and royalist convictions and was considered by his contemporaries to hold such views.

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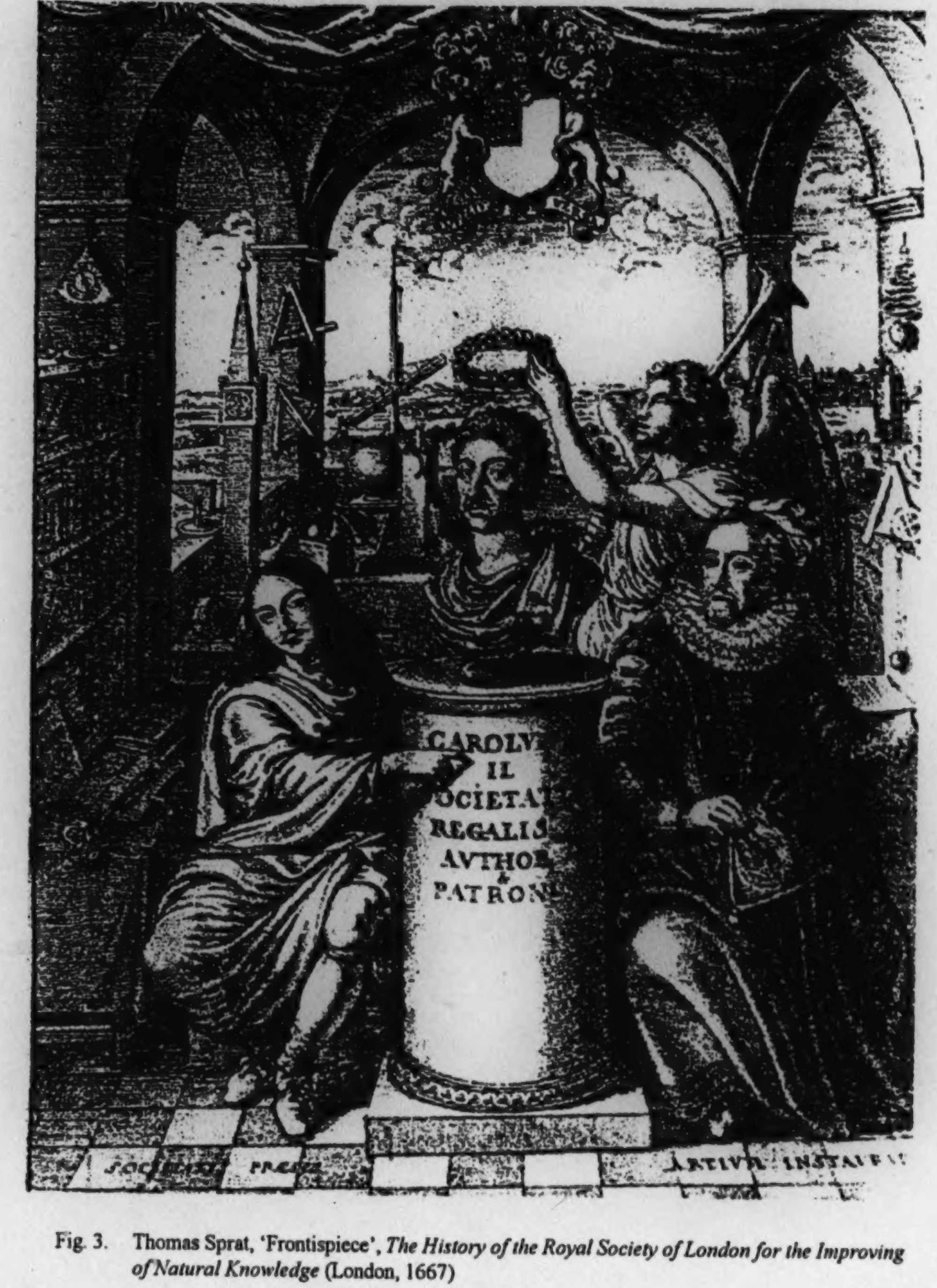
[68] Letter to Courthope, 3 January 1658/59, *Further Correspondence*, pp. 16-17.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II
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&
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Fig. 3. Thomas Sprat, 'Frontispiece', *The History of the Royal Society of London for the Improving of Natural Knowledge* (London, 1667)

CHAPTER 4

Royalists, Anglicans and the Royal Society 1660-1680

> "The Church of England therefore, may justly be styled
> The Mother of this sort of Knowledge."[1]

The Royal Society of London was formally established in 1662. A communal undertaking devoted to advancing the knowledge of nature, Fellows of the early Royal Society were concerned to establish the institution as the legitimate voice on all matters of natural knowledge, the physical and mathematical sciences as well as natural history. At the Royal Society, the early Fellows developed a set of historically dependent social technologies, and established culturally-specific, experimental methods of philosophical enquiry. John Ray had achieved modest success with his botanical catalogue, the *Catalogus plantarum circa Cantabrigiam nascentium* (Cambridge, 1660); however his natural history enterprise was temporarily overshadowed by the unique practices and protocols developed within the Royal Society during the Restoration. This chapter, therefore, will be concerned with exploring ways with which the Royal Society presented itself, and hence sanctioned philosophical enquiry, as respectable and legitimate.

The Royal Society was both politically and religiously informed and constituted. The Restoration had reinstated the monarchy to England in 1660, but many of the unresolved political and religious problems of the 1640s and 1650s also returned. In particular, many within English society continued to be bitterly divided over what type of Church settlement was desirable, and the victory of the High Anglican faction in Parliament did little to alleviate religious tension in the nation.[2] A period of instability and change, the years 1660-1680 were critical for the redefinition of social, political and religious attitudes, and the Royal Society found it necessary to seek public endorsement to legitimate its activities for investigating nature. The founding Fellows had further ambitions to promote the methods of the Society as a model for the resolution of controversy, one of the most pressing and urgent concerns within Restoration society. To justify its cooperative activities and consolidate its reputation for orthodox philosophy, the Society professed loyalty to the crown and proclaimed itself dedicated to the security and safety of the Established Church. This is not to claim that there were necessary theological commitments by the Fellows of the Royal Society which determined the course of sanctioned inquiries into nature. Rather, the Society advertised itself as loyal and orthodox, and thereby claimed to possess rightful credentials to speak authoritatively concerning natural philosophy. Furthermore, if we are to make sense of the activities of the early Society, we also need to understand the Anglican agenda, in which 'proper' and 'Anglican' natural philosophy was seen to offer a moderate middle way for resolving dispute.[3] Especially, we need to understand that the Royal Society constructed, maintained and reinforced a public image which sought the acceptance of a wider community animated by the culturally dominant values of Royalism and Anglicanism.

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[1] Thomas Sprat, *The History of the Royal Society of London for the Improving of Natural Knowledge* (London, 1667 , facsimile rpt. London: Routledge and Kegan Paul, 1958), p. 373.

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[2] Harris, *Politics under the Later Stuarts*, pp. 40-47.

[3] John Henry, 'The Scientific Revolution in England', *The Scientific Revolution in National Context*, eds. Roy Porter and Mikulas Teich (Cambridge: Cambridge University Press, 1992), pp. 178-209, pp. 190-202.

The Royal Society

The Royal Society has been assigned a prominent role in the establishment of natural philosophy in Restoration England. A small community of scientific practitioners were self-consciously determined to create an institution based on the Baconian method and deliberately organized themselves to promote a new experimental philosophy. The existence of the Society has in fact been used as an explanatory category to argue for England's key role in the reconstitution of natural knowledge in the seventeenth century. In this scenario, the Royal Society and its communications potential were a direct response to the reformulation of 'scientific' conceptions and the concomitant waxing strength of the enterprise.[4] One of the defining characteristics for the 'new science' was that new knowledge in combination with new methods and new institutions was unproblematically responsible for the development of new ways to understand nature, and so the Society's activities were crucial for the development and direction of natural knowledge during the period.[5] The notion of the scientific revolution and the designation of its activities as 'scientific' have been redefined in recent years.[6] However, the Royal Society continues to enjoy a premier place in the narrative of the seventeenth century. Current scholarship also suggests that the place of this institution in the historiography of the period is more nuanced and complex than traditional views communicate.

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[4] Richard R. Westfall, *The Construction of Modern Science: Mechanisms and Mechanics*, The Cambridge History of Science Series, eds. George Basalla and William Coleman (Cambridge, etc.: Cambridge University Press, 1971, rpt. 1977).

[5] So that in 1671 Newton was 'eager' to share his discoveries with the Royal Society and is the triumphant case for "how significant formal admission to the established scientific community can be to a scientist"; I. Bernard Cohen, *Revolutions in Science* (Cambridge and London: The Belknap Press of Harvard University Press, 1985), pp. 80-82. See among others, A. R. Hall, *The Revolution in Science, 1600-1750* (London: Longmans, 1983); Charles C. Gillispie, *The Edge of Objectivity: An Essay in the History of Scientific Ideas* (Princeton: Princeton University Press , 1960) and Westfall, *The Construction of Modern Science.*

There were, of course, other centres for investigation of the natural world and the Royal Society did not enjoy a monopoly position for the advancement of natural knowledge, or even with respect to the advocacy of an institutionalized experimental philosophy in Restoration England. The well established and London-based Royal College of Physicians had instituted research programs during the Civil War and Interregnum and was highly successful in this endeavour. The College itself was also under pressure from the rival, empirically-oriented Society of Chemical Physicians, who also insisted on the 'facts' of the matter and searched for the links between theory and experience.[7] Physicians and experimental physiologists, in collaboration with William Harvey, had formed the 'Oxford Philosophical Club', which continued as a vital research community at Oxford University during the Restoration.[8] Informal centres of information exchange and communication existed, notably the 'democratic' coffee houses of London were major sites where the outcomes of experimental trials were made public, their significance assessed and information exchanged.[9] There is a persuasive case for the role of mathematical practitioners at Gresham College and elsewhere in the development of new techniques for understanding and explaining the natural world.[10] Correspondence networks flourished especially in the provinces, notably the networks of Robert Plot (natural history), John Ray (natural history), John Aubrey (natural history and antiquarian studies), John Collins (mathematics), Richard Towneley (astronomy and meteorology), and William Cole of Bristol (natural history).

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[6] Andrew Cunningham and Perry Williams, 'De-centring the Big Picture: *The Origins of Modern Science* and the Modern Origins of Science', *British Journal for the History of Science* 26 (1993), pp. 406-432; Cunningham, 'How the *Principia* got its name', pp. 377-392; and Cunningham, 'Getting the Game Right', pp. 364-389.

[7] Harold J. Cook, *The Decline of the Old Medical Regime in Stuart London* (Ithaca and London: Cornell University Press, 1986); Webster, *The Great Instauration.*

[8] Robert Frank Jr., *Harvey and the Oxford Physiologists: Scientific Ideas and Social Interaction* (Berkeley, Los Angeles and London: University of California Press, 1980).

The existence of alternate centres of knowledge production and communication, however, does not diminish the importance of the activities of the Royal Society in the period, and there was often a common, intersecting membership among these groups and the more formally constituted Society. For instance, after the incorporation of the Royal Society, a number of Fellows of the Royal College of Physicians who also became fellows of Royal Society actively promoted the new philosophy and experimentation within the medical college. The Oxford Philosophical Club recruited many familiar names who would later become influential in the Royal Society, for instance Robert Boyle, John Wilkins and Christopher Wren, but who also maintained their connection to Oxford after

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[9] Larry Stewart, 'Other centres of calculation, or where the Royal Society Didn't Count: Commerce, coffee-houses and natural philosophy in Early Modern London', *British Journal for the History of Science*, 32 (1999), 130-153; Rob Iliffe, 'Material doubts: Hooke, artisan culture and the exchange of information in 1670s London', *British Journal for the History of Science* 28 (1995), pp. 285-315; Steven Shapin, 'Who was Robert Hooke?', *Robert Hooke: New Studies* (Woodbridge: Boydell Press, 1989), pp. 253-285; Arthur MacGregor, *Sir Hans Sloane, Collector, Scientist, Antiquary, Founding Father of the British Museum* (London: British Museum Press and Alistair McAlpine, 1994); Michael Hunter, *Science and Society in Restoration England* (Cambridge: Cambridge University Press, 1981), p. 43.

[10] J. A. Bennett, 'The Mechanics' Philosophy and the Mechanical Philosophy', *The History of Science* 24 (1986), pp. 1-28.

1660. In London, the coffee houses facilitated contacts between Fellows of the Royal Society and others involved with issues of natural philosophy but who belonged to social worlds excluded from the gentlemanly concourse of the Society. The numerous correspondence networks also connected many Fellows of the Royal Society to a larger population concerned with similar philosophical curiosities and concerns. Therefore, if the Royal Society does not qualify as the unique and unassailable instrument of new knowledge, it nevertheless exercised a considerable influence in the promotion of a specific philosophical culture in Restoration England, and its principal activities continue to remain valid avenues of historical research.

Our current understanding of the importance of the Royal Society as a voluntary, self-conscious community has become very sophisticated. The importance of the Royal Society is recognized not only for techniques of epistemological validation, but also with its strategy to establish itself as authoritative to declare on matters of fact in Restoration England. The institutionalization of the activities of its Fellows has been the focus of concern for a generation of historians and sociologists; there is now a rich repository of specialized studies on the membership, the scientific activity, the finances, the organizational structure, the material and literary technologies, the social strategies, the political context, and the ideology, or lack of thereof, in the emergent society.[11] Scholars have broadened their understanding of the Society's activities which takes into account not only the empirical and physico-mathematical components of natural philosophy, but which also attempts to understand the social, political and religious world in which philosophers acted, and their motivations for doing so.[12]

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[11] For a useful summary of the extensive literature on the Royal Society, see Michael Hunter, 'Bibliographical Essay', *Establishing the New Science: The Experience of the Early Royal Society* (Woodbridge: Boydell Press, 1989), pp. 356-368.

A public image of the Society as harmonious and free of contention was particularly important after the 'uncivil' years of the Civil Wars and Interregnum; Michael Hunter continues to remind us that in this context the Royal Society was institutionally insecure and that the 'new science' itself was unpopular and viewed with suspicion, not least because of its policy to admit Fellows of differing religious complexion.[13] The Society undertook a deliberate and self-conscious public relations exercise to disarm criticism and enlist support for the project, including the publication of Thomas Sprat's *History of the Royal Society of London* (1667). This first public defence of the Royal Society detailed the ambition of the new institution to develop an uncontentious natural philosophy and makes explicit the controversies which motivated this approach. It is true that Thomas Sprat's *History of the Royal Society* has been shown to be undeniably apologetic and concerned with responding to public criticism, and even that Sprat may have misrepresented the interests of the Society by emphasising the uncontentious nature of its activities. It would also be wrong to suggest that the public stance of the Society expressed in Sprat's *History* represented the consensus of all influential members of the Society since Hunter's works convinces that there was no unanimity on the matter.[14]

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[12] Shapin, *A Social History of Truth*; Steven Shapin and Simon Schaffer, *Leviathan and the Air Pump: Hobbes, Boyle and the Experimental Life* (Princeton: Princeton University Press, 1985).

[13] Hunter, 'Latitudinarianism and Ideology', *Establishing the New Science*, p. 25.

[14] Paul B. Wood, 'Methodology and Apologetics: Thomas Sprat's *History of the Royal Society*', *British Journal for the History of Science* 13 (1980), pp. 1-26; Michael Hunter, 'Latitudinarianism and Ideology', pp. 45-71.

These circumstances dictate caution in any attempt to interpret the text, but also serve to emphasize Sprat's intentions in the *History*: to respond to public criticism, to foster a corporate reputation for orthodox philosophy, and to legitimate its cooperative activities by appeal to ' respectable' conservative traditions and to dominant cultural values.

Royalists

If we are to accept, as Michael Hunter insists, that Sprat was attempting to align the Society with as "many consensus values as possible"[15] we must be clear what those dominant cultural values represented in Restoration England. This is not to suggest that there was an official 'ideology' of the Royal Society, nor to suggest that individual members of the Society were unanimous on the matter; rather, that there was a common opinion in Restoration society which supported both the monarchical form of government and the 'Church by law established'. In other words, values of royalism and 'Anglicanism' were not only widely held but were also majority views.

The Royalist orientation of the Royal Society has not been challenged; indeed, it has become a truism to suggest that the entire population of England was Royalist upon the arrival of Charles II in May 1660. Sprat's *History* was dedicated "to the King" as patron of a public establishment for the study of natural philosophy; royal support during the Restoration translated into an official Coat of Arms, a royal charter which empowered the Society to appoint and regulate its own printers, and the general enjoyment of benign neglect from the crown. In 1667, Sprat celebrated the beginning of the Royal Society "as it began in that time, when our Country was freed from confusion and slavery," and lauded the instigators of the 'Philosophical College' including Wilkins, Boyle and Wren, but also Seth Ward then Bishop of Exeter, Matthew Wren Bishop of Ely, and Ralph Bathurst President of Trinity College Oxford, who "finding the hearts of the Countrymen inlarg'd by their Joys, and fitted for any noble Proposition: and meeting with the concurrence of many Worthy Men, who, to their immortal Honor, had follow'd the King in his banishment."[16] The Royalist orientation of the early Society was also ensured by the appointment of William Brouncker, the first 'official' Fellow of the Royal Society, a mathematician but more significantly Chancellor to Queen Catherine. As President of the Society and member of the Executive Council (1662-1677), Brouncker was "sworn in all things belonging thereto well and faithfully to execute the said Office before His right well-beloved and Truly Cosin and Counsellor, Edward, Earl of Clarendon, Lord High Chancellor of England.[17] In fact, the Charter of the Royal Society limited Fellowship not only to individuals 'excelling in all kinds of Learning . . . [but] by how much the more eminent they are for Integrity, Honesty, Piety, Loyalty, and Good Affection toward His Majesty, His Crown and Dignity, by so much the more fit and worthy such Persons are to be judged for reception into the Society."[18] Joseph Glanvill's *Plus Ultra, or the Progress and Advancement of Knowledge* (1668) also emphasised the respectable and royalist character of the institution: "Methinks the *Reverence* we owe to the ROYAL FOUNDER and PATRON of that *Establishment*, and the respect that is due to PRINCES, PRIVY

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[15] Hunter, 'Latitudinarianism and Ideology', p. 57.

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[16] Sprat, *History of the Royal Society*, p. 58.

[17] *Ibid.*, p. 136.

[18] *Ibid.*

COUNSELLORS and PRELATES, to the most *Learned Men of all Sorts and Professions, Mathematicians, Chymists, Physicians, Anatomists, Antiquaries*, and *Philosophers*; to the PRIME NOBILITY, and so many of the *Learned* and *Ingenious* among the GENTRY."[19] There seems to be little doubt that the loyalist 'letter' as well as 'spirit' of the Charter was adhered to, especially given that the majority of members elected during the first decade of the Society's existence were aristocrats, courtiers and politicians, gentlemen or Anglican clergymen who may have seen a stable monarchy as the best preservative to order, harmony and peace in the country.[20]

Anglicans

The Restoration represented not only a restored monarchy, but also the re-establishment of the Church of England after two decades of religious disputation and sectarian disagreement, and all attempts for stability in the political nation also had to satisfy criteria for stability in the Church. In Restoration England, religious discord was seen as the primary reason for a multitude of unhappy circumstances, and rhetoric to promote religious concord became *de rigueur* as a device to invite acceptance of new ventures. In the *History*, Sprat described the dislocation in learning which had been caused by religious controversy and especially "the great a-do which has been made, in raising, and confirming, and refusing so many different Sects, and opinions of the Christian Faith. For whatever other hurt or good comes, by such holy Speculative Warrs yet . . . certainly by this means, the knowledge of Nature has been much retarded."[21] Sprat was careful to reassure his readers that the new undertaking in natural philosophy would not revive dissension within society at large and further claimed that religious disagreement could not exist within the new institution. True, Sprat may have been attempting to transform a vice into a virtue, but his declaration that the Royal Society had extended Fellowship to "Men of different Religions, Countries, and Professions of Life"[22] is also a claim that natural philosophy as practised by the Fellows of differing religious backgrounds was an activity that was not only uncontentious but capable of resolving disputes in natural philosophy. The Royal Society, according to Sprat, was concerned only with doctrinally neutral matters of fact, unadorned by speculation or hypothesis. The Society would report only "faithful records" and especially it would preserve itself from being "straitened and bounded too much up by General Doctrines."[23] While Sprat may have misrepresented the uncontentious nature of both the practice and intention of the Society to mitigate criticism, and Sprat himself reluctantly admitted that some Fellows "have been sometimes a little too forward to conclude upon *Axioms*,"[24] his irenic rhetoric also underscores a desire for an uncontentious natural philosophy within Restoration society.

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[19] Joseph Glanvill, *Plus Ultra: or the Progress and Advancement of Knowledge since the Days of Aristotle. In an account of some of the most Remarkable Late Improvements of Practical, Useful Learning: to Encourage Philosophical Endeavours. Occasioned by a conference with one of the Notional Way* (London, 1668), p. 4.

[20] Michael Hunter, *The Royal Society and its Fellows, 1660-1700: the morphology of an early scientific institution*, BSHS Monographs No. 4, 2nd edn (1994), pp. 126-128, 134-186. Hunter estimates the distribution of aristocrats, politicians, gentlemen and clergmen to be 61% of 172 newly elected members in 1660-64 and 60% of 89 newly elected members in the period 1665-69, p. 126. I have no wish to re-engage in the unproductive debate about the efficacy of head counting "Puritans" and "Anglicans". Rather I wish to suggest that the order and stability offered by the return of the monarchy was of primary importance in Restoration England. Even the well-known nonconformist, Nehemiah Grew FRS dedicated his most important work to Charles II; Grew, *The Anatomy of Plants* (London, 1682).

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[21] Sprat, *The History of the Royal Society*, p. 25.

[22] *Ibid.*, p. 63.

[23] *Ibid.*, pp. 61-62.

[24] *Ibid.*, p. 38.

Attempts to portray natural philosophy as a socially and religiously uncontentious activity were becoming commonplace throughout Europe more generally, especially after the religious troubles of the sixteenth and early seventeenth century.[25] The stance to present practice in natural philosophy as an impartial activity was not restricted to the Royal Society and in fact was the method pursued by John Ray in the *Catalogus Cantabrigiam* (Cambridge, 1660). Ray's strategy had been to describe the characteristics of plants with which all could agree, specifically the unambiguous 'matters of fact' such as physical characteristics or location near Cambridge, without recourse to the potentially contentious explanations advanced by the Aristotelian, Cartesian or Paracelsian philosophies and their associated religious connotations. In the *Catalogus,* Ray had included only those observations that "have been proved by personal knowledge or on the authority of reliable witnesses or are likely enough and probable in themselves."[26]

Joseph Glanvill, an 'unofficial' apologist for the Royal Society, also explicitly identified religious discord as a source of philosophical incivility, and saw the Society as the means by which doctrinal differences could be resolved. Glanvill raised the spectre of continued religious quarrels in his polemical *Plus Ultra: or the Progress and Advancement of Knowledge* (1668), and likewise recommended the activities of the

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[25] William Harvey's theory of the Circulation of the Blood was also judged, in part, on its potential to explain observations without appeal to contentious philosophical systems; see Roger French, *William Harvey's natural philosophy* (Cambridge: Cambridge University Press, 1995), pp. 179-226, 346-348, 384.

[26] *Ray's Flora of Cambridgeshire*, p. 25.

Society as a model for consensus and stability. The rhetoric of *Plus Ultra* similarly decried "the *Follies* and *Superstitions* of *Sects*, [who] have the *Holy Oracles* always in their mouths, and *press* them for the Service of their conceits, have prejudiced some of the pretenders to Reason."[27] Like Sprat, Glanvill also claimed that the aim of the Fellows was not to set up new theories and notions in philosophy, but rather "the First and chief Imployment is, carefully to seek and faithfully report how things are *de facto*: and they continually declare against the establishment of theories, and Speculative Doctrines, which they note as one of the most considerable miscarriages in the Philosophy of the Schools: And their business is not to Dispute, but work."[28] But Glanvill was adamant that the methodology of the Royal Society's 'experimental and free philosophy' was capable of achieving not only philosophical but also religious harmony. He declared, "there is no doubt but as [experimental learning] has altered and reformed the genius in matters of natural Research and Inquiry; so it will in its progress dispose mens Spirits to more calmness and modesty, charity and prudence in the Differences of Religion, and even silence Disputes there."[29] Oldenburg's review of the *Plus Ultra* in the *Philosophical Transactions* reiterated Glanvill's message for the potential uncontentiousness of the Society's activities, since "the business of the society is not to Dispute but Work; and their aim, not to pursue Phancyful Designs, but to free Philosophy from the vain Images and Contrivances of Fancy, by making it palpable, and bring it down to the plain Objects of the

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[27] Glanvill, *Plus Ultra*, p. 147.

[28] *Ibid.*, p. 89.

[29] *Ibid.*, p. 149.

Senses."[30] In subsequent works, Glanvill continued to justify the Society's religious program, and identified additional threats to natural knowledge as "Atheism, Sadducism, Superstition, Enthusiasm and the humour of disputing," that is, atheism, Judaism, papism, sectarianism as well as generally quarrelsome, disputatious and doctrinaire Aristotelians.[31]

It should not surprise us that Sprat, an early protégé of John Wilkins, Chaplain to George Villiers FRS the duke of Buckingham, and later Bishop of Rochester (1684),[32] and Glanvill, Rector of Bath (1666), Prebendary of Worcester (1668) and later chaplain to Charles II (1672)[33], should have seen religious division as the crucial issue in Restoration Society. Nor is it surprising that both these clergymen would have addressed the problem of religious harmony within the scope of their apologies. Among some factions in Restoration society, there was a strong appetite for religious reconciliation. John Wilkins, Fellow and Founding Member of the Royal Society, was appointed to the See of Chester in 1668 and actively promoted religious comprehension in Parliament. Buckingham, as well as Shaftsbury, were in the ascendency at court during this period and strongly supported the issue of comprehension.[34] In addition, Lord Chancellor Clarendon was attempting to work towards a moderate religious settlement during 1667-1668, an opportunity afforded by a fall from favour by Archbishop of Canterbury Gilbert Sheldon and his determined prelatical allies.

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[30] *Philosophical Transactions*, No. 36, June 15, 1668, pp. 715-716.

[31] Joseph Glanvill, *Philosophia Pia; or, a Discourse of the Religious Temper, and Tendencies of the Experimental Philosophy which is profest by the Royal Society. To which is annext A Recommendation, and Defence of Reason in the Affairs of Religion* (London, 1671).

[32] Sprat also held a prebend at Lincoln Cathedral (1660-1669), and was appointed Chaplain to Charles II in 1676; *DNB*, vol. 18, pp. 827-832.

[33] *DNB*, vol. 7, pp. 1287-1288.

[34] John Spurr, *The Restoration Church of England, 1647-1689* (New Haven and London: Yale University Press, 1991), pp. 56-57; Paul Seaward, *The Restoration* (Macmillan: London, 1991), pp. 51-52.

The existence of a significant proportion of Restoration society which worked for amelioration of the 'zealous' conformist policies of the Cavalier parliament has prompted some scholars to suggest that 'Latitudinarianism' could account for both the content and practice of natural philosophy in the last half of the seventeenth century.[35] This view proposes that a group of moderate scientific reformers, who were simultaneously moderate religious reformers, reacted against the radical religious and philosophical reforms of the Interregnum. Further and specifically, these individuals utilized the new mechanical philosophies as instruments to counteract a radical stance. Thus, acceptance of the mechanical philosophy was accompanied by a 'liberal' Anglican theology and, furthermore, explicit philosophical views were chosen precisely because they expressed a social and political ideology. Indeed, Sprat's *History* was seen to be an official expression of this ideology.[36] This view has not been widely endorsed by historians of science; the most persuasive counter-arguments maintain that the diverse metaphysical, philosophical and methodological views of the institution's founding members militated against a unanimous ideological viewpoint of the Society as a whole, even to the extent that many early Fellows were committed to neither a mechanical nor an experimental philosophy.[37]

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[35] Barbara J. Shapiro, 'Latitudinarianism and Science in Seventeenth-Century England', *The Intellectual Revolution of the Seventeenth Century*, ed. Charles Webster (London: Routledge and Kegan Paul, 1974), pp. 286-316; and Shapiro, *Probability and Certainty in Seventeenth-century England: A Study of the Relationships between Natural Science, Religion, History, Law and Literature* (Princeton: Princeton University Press, 1983).

[36] James R. Jacob, 'Restoration, Reformation and the Origins of the Royal Society', *History of Science* 13 (1975), pp. 155-176; Jacob, *Robert Boyle and the English Revolution: A Study in Social and Intellectual Change* (New York: Burt Franklin, 1977); Jacob, 'Restoration Ideologies and the Royal Society', *History of Science* 18 (1980), pp. 25-37; Margaret C. Jacob, *The Cultural Meaning of the Scientific Revolution* (Temple University Press: Philadelphia, 1988); Jacob and Jacob, 'The Anglican Origins of Modern Science: The Metaphysical Foundations of the Whig Constitution', *Isis* 71 (1980), pp. 251-267; Jacob and Jacob, 'The Saints Embalmed. Scientists, Latitudinarians, and Society: A Review Essay', *Albion* 24 (1992), pp. 435-442.

In addition, there is an intractable problem of defining the term 'Latitudinarianism' and of delimiting who exactly may have been the Latitude men. Indeed, contemporary seventeenth-century commentators had difficulty with the term, defining the Latitude men as merely a "convenient name to reproach a man that you owe a spight to"; if pressed for a more precise definition, they identified men whose Interregnum education and attitudes aligned them with neither the Puritan reformers nor the zealous Laudians.[38] The major modern proponents of a Latitudinarian influence on the Royal Society also have been unable to offer a single unambiguous definition, although all Latitudinaries were characterized by adherence to the new mechanical philosophy, or at the very least were "Baconian natural philosophers throughout the seventeenth century [who] shared a commitment to an underlying and hitherto undetected social ideology, addressed to and defined by the major moral, political and economic issues of the day."[39] The general methodological and epistemological characteristics attributed to the Latitudinarians were held to be representative of an attitude of rational argumentation rather than faith as the final arbiter of Christian belief and dogma and which promoted the position that scientific knowledge (that is, natural philosophy) would be the most reliable means of explaining creation. This characterization was necessarily vague to account for the views of Robert

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[37] Wood, 'Methodology and Apologetics'; Hunter, 'Latitudinarianism and Ideology'.

[38] P[atrick], *A new sect of Latitude-men*, sig. A2v-A3.

[39] Jacob and Jacob, 'The Saints Embalmed', p. 441.

Boyle, John Wilkins and other founders of the Royal Society from Oxford, as well as the views of the Cambridge Platonists, Henry More and Ralph Cudworth, but most specifically to include men such as John Tillotson, Thomas Tenison, Simon Patrick and even Isaac Newton himself. However, with the single exemplar of the archetypical Latitude man, John Wilkins, none of the so-called Latitudinarian clergy made any reference whatsoever to scientific interests, whether the mechanical philosophy or otherwise.[40] Further the term was intended to apply to a minority, 'modern' viewpoint in Restoration England; yet the term 'Latitudinarian' as defined, included the majority of published views on religious moderation in Restoration England.

The most clear commonality among those identified by the term Latitudinarian was opposition to Puritan theology and a desire to separate themselves from Calvinist doctrines.[41] Far from being individuals who wished "some accommodation to Dissenters," Latitudinarians were frequently among the most insistent persecutors of nonconformity.[42] Furthermore, the efforts of Wilkins and others within Parliament were emphatically not directed towards establishing a toleration of religious differences. Toleration was a stance of religious liberty toward radical sects (but not Catholics), and was explicitly seen to promise continued quarrels, divisive arguments and *de facto* separation from the Established Church; precisely the conditions which had prevailed during the Civil Wars and the Interregnum, and antithetical to what has been claimed to be the Latitudinarian ideology of securing and legitimizing the church and state against 'radicals, enthusiasts and atheists'. Members of the Royal Society no less than a majority in Restoration society stood in opposition to toleration.[43] Rather, efforts for religious peace, although ultimately unsuccessful, were directed towards comprehension of differences within the Anglican communion. The ambition of comprehension was to reunite individuals within a broad, state-established, ecclesiastically-governed English Church, and especially to accommodate the 'tender consciences' of Presbyterians who continued to want a national church and were willing to acquiesce in ecclesiastic government.

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[40] John Spurr, ''Latitudinarianism' and the Restoration Church', *The Historical Journal* 31 (1988), pp. 61-82.

[41] *Ibid.*

[42] Richard Ashcraft, 'Latitudinarinism and toleration: Historical myth versus political history', *Philosophy, Science and Religion in England, 1640-1700*, eds. Richard Kroll, Richard Ashcraft and Perez Zagorin (Cambridge: Cambridge University Press, 1992), pp. 151-177.

To suggest that Sprat was voicing values that may have appealed to a large segment of Restoration society is not to claim that he was likewise proposing to comprehend philosophical differences under the umbrella of a broad 'experimental' philosophy, managed by an official institution specifically designed to advance natural knowledge. Nor is this to claim that Sprat's rhetoric represented an explicit political or social 'ideology' held by the Society or that the *History* represented a manifesto of beliefs with a specific program for the conduct of natural philosophy. Rather, Sprat's manoeuvre may be seen as an attempt to appeal to those majority members of the Royal Society, and those members of Restoration England more generally who held similar views on comprehension, and is fully consistent with claims that Sprat was attempting to appeal to consensus values in Restoration Society.

What is more important, there is no need to construct, an 'underlying and hitherto undetected social ideology' of Latitudinarianism to explain the close links between moderate religion and natural philosophy in Restoration England. Indeed, the problem of defining "Latitudinarianism" should not only caution us against privileging a unique terminology for majority views, but may also signal the importance of widespread consensus opinion. The characteristic moderation that scholars have attributed to the Latitudinarians has in fact been described as representative of the Church of England more generally. Anglicanism has been characterized, and characterizes itself, as a *via media*, a middle way between the extremes of either the Protestant, especially Calvinist, Reformers or the Church of Rome. Indeed, the English Church had been created as a compromise solution to religious tensions and was deliberately constructed throughout the seventeenth century as a means of resolving religious diversity.[44] The distinguishing feature of Anglicanism was its commitment to theological inclusion, a position which enabled a 'latitude of opinion' to be held concerning fundamental 'truths' of religion, while seeking agreement on nonessential practices. A monolithic English Church in which all Anglicans were agreed on doctrine did not exist. On the other hand, the principle that members of a broad English church could unite together under a uniform discipline had become an enduring feature of what it meant to be an Anglican.

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[43] Hunter, 'Latitudinarianism and Ideology', p. 58-62.

There is no satisfactory definition which will fully capture the array of beliefs and opinions as well as the dynamic and evolving nature of the English Church, or the complex social, theological and practical aspects of "Anglicans" and "Anglicanism." Scholars, however, have identified a pattern of conformist attitudes, initially expressed in the late Elizabethan period especially by Richard Hooker, which is broadly representative of an Anglican style in the seventeenth century. Distinctively Anglican characteristics included willing conformity to the ceremonies of the English Church, acceptance of church government, and a tendency to use the epithet 'Puritan' against opponents. This definition incorporates in its membership, but does not privilege, individuals designated as "Laudians" in the 1630: those Anglicans closely associated with Archbishop William Laud and who also supported his ecclesiastical policies. [45] By 1640, if not earlier, the Church was claiming to occupy a middle ground between the Catholic and the Reformed Churches and deliberately promoted a vision of itself as the "honest Broker" of Christendom, and mediator between confessional discords.[46]

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[44] Anthony Milton, *Catholic and Reformed: The Roman and Protestant Churches in English Protestant Thought 1600-1640* (Cambridge: Cambridge University Press, 1995); Peter White, 'The *Via Media* in the Early Stuart Church', *Reformation to Revolution: Politics and Religion in Early Modern England,* ed. Margo Todd (London and New York: Routledge, 1995), pp. 78-96; and Peter Lake, *Anglicans and Puritans? Presbyterianism and English Conformist Thought from Whitgift to Hooker* (London, etc. Unwin Hyman, 1988).

This is not to claim that all Anglicans were moderate or conciliatory; just as scholars have tended to focus on radical Puritan views, much attention has concentrated on individuals 'zealously Anglican' and opposed to the principle of comprehension.[47] The

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[45] Milton, *Catholic and Reformed*, pp. 8-9, Lake *Anglicans and Puritans*, p. 7.

[46] Milton, *Catholic and Reformed*,p.528; White,'The *Via Media* in the early Stuart Church', pp. 80-81.

[47] Michael Hunter identifes Seth Ward for his opposition to toleration in general. As a Fellow of the Royal Society and Chaplain to Charles II, Ward's influential sermon *Against Resistance of Lawful Powers* (1661) has been submitted as evidence of Anglican intractability within the Royal Society; Hunter, *Science and Society*, pp. 116; *Establishing the New Science*, p. 58. However, Ward's position advocating obedience to legally constituted authority is fully consistent with well-established moderate Anglican opinion and on comprehension; see also comments by Robert Sanderson, Bishop of Lincoln. Note that Hunter also identifies Ward as Bishop of Salisbury, but in 1661 he was still Chaplain to Charles II and only subsequently elevated to the bishopric (Exeter 1662 and Salisbury 1667). Seth Ward, *Against Resistance of Lawful Powers, a sermon preached before the King at Whitehall November 4, 1661* (London, 1662) and reprinted in *Six Sermons preached by the Right Reverent Father in God Seth, Lord Bishop of Sarum* (London 1672).

'middle way', however, represented an 'ideal' moderate course to which Anglican polemicists could appeal to promote peace and unity in Church and state. During the 1630's Anglican methods of mediation were pursued by Lucius Cary Viscount Falkland, and other influential members of the Great Tew Circle to chart a course between Calvinist Puritanism and Laudian polity.[48] In the popular and oft-printed *Religio Medici* of the 1640s and 1650s, Anglican moderation was seen by Thomas Browne to offer a realistic possibility of reconciliation for the "present antipathies between the two extremes, their contrarieties in condition, affection and opinion."[49] A conciliatory middle way was adopted by John Ray to minimize philosophical, and thus implicitly also political and religious, disagreement in his *Catalogus Cantabrigiam* (1660).[50] Therefore, 'proper' and 'Anglican' natural philosophy, as the traditional 'handmaiden to theology' and manifested by a 'latitude of opinion', was seen to offer a middle way for resolving philosophical disputes, while at the same time promoting a methodology to achieve consensus.[51]

It was the rhetoric of a middle way in natural philosophy to which Sprat appealed in his apology for the Royal Society. Sprat also described the "Universal Temper" of the English as those with "the middle qualities" and a "well-proportioned genius."[52] What

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[48] Henry, 'The Scientific Revolution in England', pp. 192-193.

[49] Thomas Browne, *Religio Medici*, ed. James Winny (Cambridge: Cambridge University Press, 1963), p. 5.

[50] See Chapter 2.

[51] John Henry, 'The Scientific Revolution in England', pp. 190-202. Natural philosophy, in fact, had been specifically constructed to support particular 'orthodoxies' and interpretations of the truth. See French and Cunningham, *Before Science*.

[52] Sprat, *History of the Royal Society*, pp. 112-115.

Sprat proposed was a natural philosophy sceptical of speculation and its attendant dangers of disagreement, and which promoted an epistemology that attempted to discover matters of fact upon which all could agree.[53] It may well be the case, as John Henry suggests, that moderation and compromise were virtually unanimous sentiments among seventeenth-century natural philosophers, convinced that "this very English approach" was the safest way to resolve differences. It may also be perfectly understandable that Anglican epistemology and methodology would, perhaps unconsciously, be adopted and adapted to natural philosophy.[54] Henry points to a 'characteristically English' theological rhetoric of compromise and moderation precisely because those principles seemed to offer the best hope of resolving disputes and achieving consensus. The Anglican achievement in natural philosophy, then, may be seen to recognize and promote those specific methodological principles for dispute resolution despite individual preferences, practices and opinions in natural philosophy.[55]

Most historians agree that the Royal Society was inspired by Bacon's plan for a reformed natural philosophy.[56] One aspect of Baconian reform that the natural philosophers of the Royal Society found particularly appealing was the admonition to avoid philosophical commitment in favour of a balanced, sceptical empiricism. In fact, Bacon's persuasive model of how research into the natural world could be conducted, and how the investigators should be organized, had been specifically designed to regulate disagreement. Bacon's motivation for reforming natural philosophy cannot be separated from his role as a servant of the Crown, and especially his concern with the continued peace and harmony of the English community. As early as the 1590s, Bacon saw his duty as a secular statesman to resolve conflict in Church affairs, and he was committed to pragmatic solutions for settling those disputes. Bacon was convinced that the crown and the church were under threat from radical Puritan reformers; indeed, he saw Puritan demands upon the church as having rebellious implications for the state. Highly critical, Bacon described Puritans as self-righteous and disrespectful, censorious, immoderate, zealous, stubborn, and holders of "prejudicate opinions'; that is, unprofitable opinions which provided neither knowledge of truth, sobriety or peace.[57] Bacon's plan for preserving peace and order was to neutralize philosophical and religious controversialists by controlling knowledge. Bacon believed that controversies could be avoided by insisting upon "industrious observations, grounded conclusions, and profitable inventions and discoveries" under the umbrella of a state-directed institution to control and regulate knowledge.[58] What is most important, Bacon's views on the organization of natural philosophy were informed by the religious temper of the time, although by the 1590s Puritan ambitions for further religious reformation in England were largely disappointed.

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[53] Wood, 'Methodology and Apologetics', p. 18; Peter Dear, '*Totius in Verba*: Rhetoric and Authority in the Early Royal Society', *Isis* 76 (1985), pp. 145-61; Shapin and Schaffer, *Leviathan and the Air Pump, pass.*

[54] Henry, 'The Scientific Revolution in England', p. 197.

[55] *Ibid.*, pp. 200-202.

[56] Lorraine Daston and Katharine Park, *Wonder and the Order of Nature, 1150-1750* (New York: Zone Books, 1998), pp. 220-231; Steven Shapin, *The Scientific Revolution* (Chicago and London: University of Chicago Press, 1996), p. 85; Julian Martin *Francis Bacon, the State and the Reform of Natural Philosophy* (Cambridge: Cambridge University Press, 1992), pp. 5; Hunter, *Science and Society*, pp. 8-31.

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[57] Martin, *Francis Bacon*, pp. 38-43.

[58] *Ibid.*, pp. 62-63.

The 1590s represented a period of relative domestic peace and safety which also enabled the Established church to consolidate its role as the preeminent state institution. Church leaders were concerned with issues similar to Bacon's, namely preservation of the legitimate order of state and society against powerful religious alternatives, the security of the English Church and the concomitant resolution of controversy. At this time, the most enduring defence of the Church was written by Richard Hooker, whose *Laws of Ecclesiasticall Politie* (1594-1597) provided justification for the practices, ceremonies and government of the English Church and which is identified with the emergence of a uniquely Anglican religious culture during the seventeenth century.[59] Hooker believed that the challenges posed by religious reform were not only politically and religiously subversive, but menaced the entire order of English Society. Hooker saw the English church as the middle path between the Roman and the Protestant Reformed churches. According to Hooker, only the English Church offered a safe and secure way to unity and order. Hooker argued that, since Christ had died for all men, all men could participate in Christ's church and eternal salvation was not limited to a self-identified Godly elect. Not surprisingly, Hooker saw the solution to the religious controversy engendered by the Puritans to be an 'outward profession of faith', that is submission to the discipline and authority of the Church of England. Finally, Hooker also believed that the study of nature was fundamental to legitimizing the authority of the English Church, and especially in justifying a rational 'middle way' in religious discipline. "But of this we are right sure,"

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[59] Lake, *Anglicans and Puritans*, p. 227; A. S. McGrade, 'Hooker's Polity and the Establishment of the English Church,' *Richard Hooker: Of the Laws of Ecclesiastical Polity*, eds. A. S. McGrade and Brian Vickers, Abridged Edition (New York: St. Martin's Press, 1975), pp. 11-59.

Hooker declared, "that nature, scripture, & experience it selfe, have all taught the world to seeke for the ending of contentions by submitting itself unto some iudicall and definitive sentence, whereunto neither part that contendeth may under any pretense or coulor refuse to stand."[60]

In other words, Hooker thought that the rational search for order and stability in society could be discovered by investigating the underlying, orderly laws of the world divinely regulated by an intelligent Creator.[61] Hooker, of course, was not unique in his understanding of the interrelationship between God, scripture and the created world. By the seventeenth century, the role of natural philosophy and the study of nature was well understood to represent the means by which man could achieve knowledge of God and approach knowledge of God's intentions for the world.[62] It was also well understood that without God's laws of nature, the universe would be unable to function,

> since the time that God did first proclaime the edicts of his law upon it, heaven and earth have hearkned unto his voice, and their labour hath bene to do his will. He made a law for the raine. He gave his decree unto the sea, that the waters should not passe his commandement. Now if nature should intermit her course, and leave altogether, though it were but for a while, the observation of her own laws: if those principall and mother elements of the world, whereof all things in this lower world are made, should loose the qualities which now they have, if the frame of that heavenly arch erected over our heads should loosen & dissolve it self; if celestiall spheres should forget their wonted motions and by irregular volubilitie, turne themselves anyways as it might happen: if the prince of the lightes of heaven which now as a Giant runne his unwearied course, should as it were through a languishing faintnes begin to stand & to rest himselfe; if the Moon should wander

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[60] Richard Hooker, *The Laws of Ecclesiasticall Politie, Books I-V [1594]-1597* (Menston, England: Scholar Press, facsimile edition 1969), p. 26.

[61] Neither Hooker nor Bacon would have been unique in this attitude. Most natural philosophers of the seventeenth century understood the universe as a creation of an Intelligent Will devising the laws that nature should obey; see especially Brooke, *Science and Religion*, pp. 52-151.

[62] French and Cunningham, *Before Science;* Cunningham, 'How the *Principia* Got its Name', pp. 377-392; Cunningham, 'Getting the Game Right', pp. 265-388.

> from her beten way, the times and seasons of the year blend themselves by disordered and confused mixture, the winds breathe out their last gaspe, the cloudes yeeld no rayen, the earth be defeated of heavenly influence, the fruites of the earth pine away as children at the withered breasts of the mother no longer able to yeeld them reliefe, what would become of man himself, whome these things now do all serve: See we not clearly that the obedience of creatures unto the lawe of nature is the stay of the whole world.[63]

If the universe and all of God's creations were subject to divine law, and nature itself nothing but "God's Instrument," man therefore could know God's intentions for the world by the study of lawful nature. Firstly, Hooker argued that the laws of nature were the foundation for all knowledge, "For that which all men have at all times learned, nature herself must needs have taught; and God being the author of nature, her voyce is but his instrument. By her from him we receive whatsoever in such sort we learn."[64] Equally important, however, was the notion that God's immutable, natural laws, which governed all men at all times, could be discovered through the study of nature: "Yet further besides this, the knowledge of every the least thing in the whole world, hath in it a second peculiar benefit unto us, in as much as it serveth to minister rules, Canons and laws for men to direct those actions by, which we properly term humaine."[65] Hooker recognized a hierarchy of different laws, the most important being the immutable supernatural laws that God had revealed in scripture and which men are bound to follow.[66] There were also some "meerly humane laws" imposed by "politique society" for the regulation of communities; but these laws were for convenience and expediency and men consented voluntarily to follow them.[67] Some laws bound man to obey, and some laws were not binding; however, *all* laws of whatever kind are "fraught even with laws of nature" which "do always bind."

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[63] Hooker, *Laws of Ecclesiastical Politie*, pp. 52-53.

[64] *Ibid.*, p. 63.

[65] *Ibid.*, p. 64.

[66] *Ibid.*, pp. 86-87.

Natural laws had the advantage of being universally, self-evidently true. Natural laws, Hooker claimed "are investigable by reason without the help of revelation supernaturall and divine. Finally in such sort they are investigable, that the knowledge of them is generall, the world hath always been acquainted with them . . . it is not agreed upon by one, or two, or few, but by all."[68] If the Church of England therefore, was founded on natural laws, then all men were bound, by nature, to obey those laws: "Law rationall, therefore, which men commonly use to call the law of nature, meaning thereby the law which humaine nature knoweth it self in reason universally bound unto."[69] Furthermore there could be no disagreement about the order and discipline imposed by the English Church, because this too was founded on those natural laws which were incontestable, enjoyed universal consent and which in fact fostered agreement. Indeed, Hooker claimed, "there can be no less acknowledgement then that [nature's] feat is the bosome of God, her voyce the harmony of the world, all things in heaven and earth doe her homage, the very least as feeling her care, and the greatest as not exempted from her power, but Angels and men and creatures of what condition so ever, though each in different sort and maner, yet all with uniform consent, admiring her as the mother of their peace and joy."[70] Hooker argued for the authority of the English church, because it derived not only from scripture, and tradition, but especially from reason, and was therefore an authority that united both knowledge of God and knowledge of God's creations. Hooker concluded that the Church of England was a true church founded on a rational religion and grounded in the laws of nature which were incontestable, incontrovertible, and promoted unity and peace. The ultimate implication of such a position therefore, is that the study of nature's laws could only reveal God's laws.

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[67] *Ibid.*, pp. 71-75.

[68] *Ibid.*, p. 66.

[69] *Ibid.*, p. 66-67.

The appeal of Hooker's rhetoric, as that of Bacon's, was manifest throughout the seventeenth century as a resource for established ideological positions. Especially during the Restoration, however, Hooker's vision of the English church became stabilized as properly Anglican and his work invoked as the "great and impenetrable shield" for the safety of the church of England.[71] The *Laws of Ecclesiastical Politie* were reprinted in 1662, 1666, 1682, and 1685, dedicated to the reinstated Charles II, with the further claim that Charles I, "near His Martyrdom," recommended Hooker's *Laws of Ecclesiastical Politie* "to his dear Children as an excellent means to satisfie Private Scruples, and settle the Public Peace of this Church and Kingdom."[72] The Restoration editions however, included several important justifications previously unpublished, especially Book VII devoted to the scriptural warrant for episcopal government, and Book VIII detailing

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[70] *Ibid.*, p. 96.

[71] 'Dedicatory Epistle to Richard Hooker', *The Laws of Ecclesiastical Politie* (London 1662).

[72] *Ibid.*, Title Page.

Hooker's theory of royal supremacy, especially in ecclesiastical affairs.[73] Hooker himself, "that Learned, Godly, Judicious, and Eloquent Divine," became the subject of a "Life" by Izaak Walton to celebrate the enduring achievements of Anglicanism,[74] and his authority mobilized whenever appeal to conservative and traditional values were crucial.

Thomas Sprat was also careful to associate the values of the Royal Society with those of the Church of England by claiming,

> This will be evident, when we behold the agreement that is between the present Design of the Royal Society, and that of our Church in the beginning. They both may lay equal claim to the Word Reformation; the one having compass'd it in Religion, the other purposing it in philosophy. They both have taken a like course to bring this about; each of them passing by the corrupt copies, and referring themselves to the perfect Originals for their instruction; the one to the Scripture, the other to the Large Volume of the Creatures. They are both unjustly accus'd by their enemies of the same crimes, of having forsaken the Ancient Traditions, and ventur'd on Novelties. They both suppose alike, that their Ancestors might err; and yet retain a sufficient reverence for them. They both follow the great Praecept of the Apostle, of trying all things. Such is the harmony between their Interests and Tempers. It cannot therefore be suspected, that the Church of England, that arose on the same method, though in different works, that Heroically pass'd thorow the same difficulties, that relies on the same Soveraign's Authority, should looke with jealous eyes on this Attempt, which makes no change in the principles of mens consciences, but chiefly aims at the increase of Inventions about the works of their hands.[75]

Sprat was legitimatizing the Royal Society as an English institution and defending it as an instrument necessary to uphold the safety of the Established Church. "The Church of England" Sprat maintained, "therefore may justly be styl'd the Mother of this [experimental] sort of Knowledge; and so the care of its nourishment and prosperity peculiarly lies upon it."[76] He further suggested that a reciprocal relationship existed between the Church and the new Royal institution. Benefits would accrue to the Church from the success of the Royal Society and its 'practical philosophy' in terms of protecting the church from 'novelties' in religion. On the other hand Sprat argued, "nor will experimental Philosophy be unthankful for the assistance it shall receive: for it will enable us to provide before hand, against any alterations in Religious affairs, which this Age may produce.[77]

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[73] Although unpublished at the time of Hooker's death, McGrade claims that there is no question that Books VII and VII are authentic; McGrade and Vickers, *Hooker's Ecclesiastical Polity*, pp. 27-28.

[74] Izaak Walton, *The Life of Richard Hooker, the author of those learned books of the Laws of Ecclesiastical Polity* (London, 1665, 1670, 1675). During his career, Walton, the archetypal Royalist man of letters, wrote "*Lives*" of five contemporary Anglican leaders: John Donne (1640), Henry Wotton, (1651), George Herbert (1670) and Robert Sanderson (1678). While our understanding of Hooker may be more complex than the hagiography presented by Walton, nevertheless the work is indicative of the high esteem Hooker was accorded during the Restoration. For recent work on Hooker's place in the development of Anglican culture, see William J. Bouwsma, 'Hooker in the context of European cultural history', *Religion and Culture in Renaissance England*, ed. Claire McEachern and Debora Shuger (Cambridge: Cambridge University Press, 1997), pp. 142-158; Debora Shuger, '"Society supernatural": the imagined community of Hooker's *Laws*', *Ibid.*, pp. 116-142; A. S. McGrade, 'Introduction', *Richard Hooker: Of the Laws of Ecclesiastical Polity*, pp 11-40; Peter Lake, *Anglicans and Puritans*; and Milton, *Catholic and Reformed*, *passim*.

[75] Sprat, *History of the Royal Society*, p. 371

Henry Oldenburg's review in the *Philosophical Transactions* fully endorsed Sprat's views on the monarchy and the church, although part of the review further quantified and classified the Society's activities which may indicate he was dissatisfied with the 'scientific content' of the work.[78] Oldenburg concurred with Sprat's dedication of the *History* to Charles II, "It was indeed highly suitable, that the History of the Royal Experimenting Society should be dedicated, as the Candid Author of it hath done, to that King, who is the first of all the Kings of Europe, that confirmed this Noble Design of

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[76] *Ibid.*, p. 373.

[77] *Ibid.*, p. 374.

[78] Henry Oldenburg, 'An account of 'The History of the Royal Society of London, for the Advancement of Experimental Philosophy', by Tho. Sprat', *Philosophical Transactions 2* (1667), pp. 501-506.

Experiments, both by his own Example, and by a public Establishment."[79] Oldenburg also reinforced Sprat's claims that the 'new Experimental Learning' being promoted by the Royal Society "is not at all dangerous to Religion in general, so it is not to the Doctrine of the Gospel, nor that of the Primitive Church, or of the Church of England."[80] Finally, Oldenburg presented the 'Experimental way' as the "most beneficial and proper study," fundamentally different from other learning which is "charged to consist in Arguing and Disputing and to be apt to make our Minds lofty and Romantick; presumptuous and obstinate; averse from a practical Course, and unable to bear the difficulties of Action Propense to things, which are no where in use in the world; and careless of their own present times, by doting on the past."[81]

Oldenburg encouraged Joseph Glanvill to publish *Plus Ultra, or the Progress and Advancement of Knowledge* (1668) as a supplement to Sprat's *History* in order to further illustrate the solid achievements of the Royal Society and the benefits of the new philosophy.[82] Glanvill likewise was concerned to position the activities of the Society as safe for the English Church. In addition to listing prominent members of the Church who were associated with the endeavour, Glanvill also claimed that there was unqualified support for the Royal Society among many members of the church establishment. "Besides which," Glanvill asserted, "I think fit to add here, that We of the CLERGIE have no reason to apprehend danger from that *Constitution*, since so many *Pious, Learned*, and *Excellent* Persons of our Order, are *Members* of *that Body*."[83] Glanvill concluded that the project of the Royal Society would not only solve the problems of religious dissension, but was the best prescription to end controversy more generally, "For the free sensible Knowledge tends to the altering the Crafts of mens minds, and so cures the Disease at the root; and true Philosophy is a Specific against Disputes and Division."[84]

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[79] *Ibid.*, p. 501.

[80] *Ibid.*, p. 504.

[81] *Ibid.*, pp. 503-504.

[82] Hunter, 'Latitudinarianism and Ideology', p. 62.

We are reminded, of course, of the insecure position of the Royal Society in the early years of its existence, and that the founding members of the Royal Society deemed it necessary to defend the Society and its activities from religious and political opponents. Although the Society continued to support Sprat's *History* as an "official" statement,[85] at least one critic has been identified for his "devastating" attacks on the new institution, specifically Henry Stubbe's *Legends no histories: or a specimen of some animadversions upon the History of the Royal Society* (London 1670). However, Stubbe was careful to claim that his criticisms against the "Authors of this *History* and Mr.Ganvils Book" were also intended as a defence of the English Church. Certainly Stubbe was concerned that the 'novellties' in philosophy being proposed by the Society were insufficiently demonstrated and hence care should be exercised when accepting them. Stubbe also claimed that the Society was promoting errors in 'matters of fact' and as such would fail in its ambitions to put an end to controversy. However, Stubbe was primarily concerned that the rejection of

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[83] Glanvil, *Plus Ultra*, p. B3v.

[84] *Ibid.*, p. 149.

[85] Hunter, 'Latitudinarianism and Ideology', pp. 64-65; Hunter, *Science and Society*, pp. 136-140.

Aristotelian philosophy would weaken the authority of the English Church and leave it vulnerable. He believed that the traditional tools of scholasticism were required to defend the faith against attacks from its religious enemies. In fact, the 'old philosophy' had long been seen as the appropriate weapon to defend the particular viewpoints of the Anglican Church and to provide the appropriate tools of persuasion.[86] Stubbe feared if "Those Metaphysics which the constant policy of Christendom hath found so advantageous, that without a Miracle we could not have born up against the Heathen-Philosophers, Arrians, Sarracens, and Socinians, and out of which we do so confound the Papists, these must be laid aside. And are we not then in a fit posture to encounter Bellarmine and Baronius?"[87] Friends and foes of the Royal Society alike, therefore, were concerned to position their rhetoric in terms of the protection and safety of the church and state.

Conclusion

After its founding in 1662, the Royal Society of London became an important institution in Restoration England which had ambitions to direct the future course of sanctioned inquiries into nature. To present itself as the legitimate authority to speak on matters of natural philosophy, the Society aligned itself with consensus values within Restoration England, which saw both a stable monarchy and a strong national church as the best preservatives for social harmony. The Society therefore, advertised itself as an institution which identified with the culturally dominant values of royalism and

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[86] See especially French and Cunningham, *Before Science*, *passim*.

[87] Henry Stubbe, 'Preface to the Reader', *Legends no histories: or a specimen of some animadversions upon the History of the Royal Society* (London 1670), n.p.

Anglicanism. Thus, it proclaimed "Integrity, Honesty, Piety, Loyalty, and Good Affection toward His Majesty, His Crown and Dignity"[88] and emphasized the "agreement that is between the present Design of the Royal Society, and that of our Church in the beginning."[89] The Society further claimed that its activities would serve to preserve the safety of the Established Church and the security of 'proper' religion because natural philosophy and true religion were partners in a reciprocal and mutually beneficial enterprise.

The Royal Society saw its additional role as providing a viable example for settling controversy within society more generally, in part, by utilizing an Anglican rhetoric of compromise and moderation precisely because those principles were seen to offer the best hope of resolving disputes and achieving consensus. Thus the Society's achievement in natural philosophy was to recognize methods for epistemological validation as well as procedures for dispute resolution which adopted and promoted a distinctively Anglican conciliatory *via media* as the safest way to promote peace both in religion and in natural philosophy despite individual preferences, practices and opinion. As we shall see in Chapter 5, the Royal Society saw the particular methods and practices of natural history as the ideal 'middle way' for the resolution of disputes and the achievement of consensus.

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[88] Sprat, *History of the Royal Society*, p. 136.

[89] *Ibid.*, p. 371.

CHAPTER 5

"It being the design of the Royal Society":[1] Natural History and the Royal Society

One of the primary ambitions of the Royal Society was to promote the acquisition of new knowledge about nature in order to establish a 'correct' natural philosophy. While the Society investigated an array of approaches to achieve this objective, it specifically identified the methods and practices of natural history as the best and safest means for obtaining novel and noncontroversial knowledge while at the same time avoiding disagreements in philosophy as well as in society more generally. As we have seen, spokesmen for the Royal Society were careful to align the institution with as many consensus values in Restoration England as possible. More than mere rhetoric however was necessary, and the Society's practical implementation of their public utterances found expression in particular natural history projects. During the first two decades of its existence, the Society encouraged many natural historians, among others John Ray and Robert Hooke, who approached their various projects using a variety of methods and techniques. Thus, there was no single and consistent definition of natural history at the Royal Society during the 1660s and 1670s, but an array of natural historical activities was endorsed as legitimate. The Society also acted as a direct sponsor for Nehemiah Grew's project on plant physiology. Grew's deliberate method for his natural history undertaking was grounded upon the tradition of *historiae* to produce law-like statements about nature. Grew's natural history was consonant with the overall ambitions of the Royal Society for investigating nature as well as the experimental philosophy promoted by Robert Boyle and others. What is also important about the Society's sponsorship are self-conscious attempts to present Grew as loyal to the crown and thus by implication, without threat to the Anglican establishment, despite Grew's self-professed nonconformity.

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[1] *Philosophical Transactions*, January 6, 1665/6, no. 8, p. 140.

Natural History at the Royal Society

Most historians of science have recognized the leadership role of Robert Boyle in the philosophical community of the Restoration and are comfortable with the story of the creation of experimental practice and its entrenchment in the new institution. This focus on the 'new science' and its experimental technologies however, has had the unintended effect of making the significance of natural history invisible. Although the Royal Society's appeal to gentlemen 'curiosi' and 'virtuosi' for patronage and support is well known,[2] natural history has been conveniently dismissed as irrelevant, or if not somewhat disreputable. In fact, natural history enjoys the historical judgement as mere Baconian empiricism, with little more to offer than programmatic justification for the indiscriminate collection of curiosities or the accumulation of 'true facts' about a place or thing.[3] Certainly, the early Society coopted the rhetoric of Francis Bacon, and especially his promotion of natural history as indispensable to a reformed natural philosophy is well known.[4] Natural history, however, was also the central undertaking of the Royal Society, and indeed the burden of the Society's public image rested on the qualitative observational and experiential natural histories celebrated by Sprat and Glanvill, reported by Henry Oldenburg, and found in many of the writings of Robert Boyle.[5] Even a casual examination of the *Philosophical Transactions,* recently called Oldenburg's "newsletter of natural history"[6] shows that natural historical activity was the Society's most consistent endeavour. Early in his career as editor of the Society's communications vehicle, Oldenburg articulated the Society's mission statement: "it being the Design of the R.Society, for the better attaining the end of the Institution, to study Nature rather than Books, and from the observations made of the Phenomena and Effects she presents, to compose such a History of Her, as may hereafter serve to build a solid and Useful Philosophy upon."[7] Thomas Sprat, in the well-worn quotation from his *History of the Royal Society,* described the work of the Fellows of the Society as one which would be "in short to make faithful Records, of all the Works of Nature, or Art . . . They have striven to preserve it from being over-press'd by a confus'd heap of vain, and useless particulars, or from being straiten'd and bounded too much up by General Doctrines."[8] In the next year, Joseph Glanvill reiterated that "the main intendment of this Society is to erect a well-grounded Natural History, which takes off the heats of wanton phancie, hinders its extravagant excursions, and ties it down to sober realities."[9] Many socially prominent individuals contributed their private time, energy and resources to the task of accumulating, manipulating and recording nature. Furthermore and importantly, the participants themselves consistently identified their primary activity as natural history.[10]

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[2] Daston and Park, *Wonders and the Order of Nature*, pp. 215-225; Katie Whitaker, 'The culture of curiosity', *Cultures of Natural History*, ed. N. Jardine, J. A. Secord and E. C. Spary (Cambridge, etc.: Cambridge University Press, 1996), pp 75-90; Michael Hunter, 'Between Cabinet of Curiosities and Research Collection: The History of the Royal Society's repository', *Establishing the New Science*, pp. 123-155.

[3] See for instance Shapin, *The Scientific Revolution*, p. 90; Hunter, *Establishing the New Science*, pp. 123-155; J. L. Heilbron, *Physics at the Royal Society during Newton's Presidency* (Los Angeles: William Andrews Clark Memorial Library, University of California, 1983), p. 4.

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[4] Martin, *Francis Bacon,* pp. 141-171; Daston and Park, *Wonders and the Order of* Nature, pp. 215-244; and Shapin, *The Scientific Revolution,* pp. 65-95.

[5] Wood, 'Methodology and Apologetics', p. 6 The definition of. natural history as mere Baconian empiricism which relied on the collection and collation of 'facts' may be an artifact of nineteenth century polemicists, for instance Thomas Huxley, to professionalize the discipline; see Lynn K. Nyhart, 'Natural History and the 'new' biology', *Cultures of Natural History,* pp. 426-443.

[6] Daniel Carey, 'Compiling Nature's History: Travellers and Travel Narratives in the Early Royal Society', *Annals of Science* 54 (1997), pp. 269-292, see esp. p. 272.

[7] *Philosophical Transactions,* January 6, 1665/6, no. 8, p. 140.

Natural history was seen to be the bedrock foundation for both theory and practice. Participants in natural history projects at the Royal Society defined these efforts so broadly as to encompass virtually all the activities of the young Society. Natural history was not just the surface appearance of natural products, but included observations of sun spots, mountains of the moon, eclipses, the nature of meteors and winds, the discovery of new lands, the motion of the sea, the spring of the air, the internal structures of the human body and more.[11] Proper histories of nature could be obtained by immediate experience, but could also be mediated by instruments or result from the intervention by various techniques. Especially "for the searching out the beginnings and depths of Things, and discovering the intrigues of remoter Nature, there are remarkable Arts, and multitudes of excellent Instruments . . . The Arts in which I instance, are Chymistry,

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[8] Sprat, *The History of the Royal Society*, pp. 61-62.

[9] Glanvill, *Plus Ultra*, p. 89.

[10] Wood, 'Methodology and Apologetics', p. 6.

[11] Sprat, *The History of the Royal Society*, pp. 72-75.

Anatomy and Mathematics: The instruments such as the microscope, telescope, thermometer, barometer and the air pump."[12] Natural history at the Royal Society, then, was the disciplined practice of observing, analysing, measuring, dissecting, and 'vexing' nature, often using the latest techniques and instruments for those purposes. Further, natural historians were alert to the potential for error and misinterpretation of data, and so the universal validity of their observations depended on repeated experience to act as guarantor, that is, how things happen in nature always or for the most part.[13]

Shapin and Schaffer in particular have documented the political considerations that underlay attempts to manage philosophical dispute and foster consensus within the confines of developing experimental technologies and rival interests. Their study has shown the importance of Boyle's efforts to establish the experimental philosophy as a means of determining truth and managing dispute in natural philosophy by an insistence on 'matters of fact.' These authors also situate the strategies of dispute resolution and knowledge validation specifically within the political and social context of Restoration England, where the techniques developed by the Royal Society were intended to provide explicit models for settling controversy and guaranteeing assent within English Society more generally.[14] The Royal Society was concerned to institute an uncontentious natural philosophy by the establishment of matters of fact, and not to be 'too forward' to interpret their findings in accordance with 'tyranny of the antients', the 'dogmatism of the moderns', or the 'pretensions of the chymists'.[15] The determination of the 'just and full examination' of matters of fact had two purposes according to Sprat: to avoid dispute and to reach consensus. Sprat described the success of the Society in the first of these ambitions: "That they have avoided these dangers [of dissension] for the time past; there can be no better proof, than their constant practice; wherein they have perpetually preserv'd a singular sobriety of debating, slowness of consenting, and moderation of dissenting. Nor have they been only free from Faction, but from the very Causes, and beginnings of it."[16] However, the method for avoiding dispute was intimately associated with the second aim of the Society, "which is to judge and resolve upon the matter of Fact," and this depended entirely on natural history. To resolve matters of fact, a critical history of the natural or experimental event or phenomena would be put before the Fellows and deliberated upon until

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[12] Indeed, historians of science have overwhelmingly endorsed a model of the 'new science' at the early Royal Society which privileges accounts of establishing the experimental method of philosophical enquiry (by Boyle, Hooke Glanvill, *Plus Ultra*, pp. 9-10.

[13] If today we see some of these activities as 'experiments' rather than *historia*, this ambiguity may reflect our own linguistic construction of scientific practice rather than 17th century understandings of their activities.

[14] Shapin and Schaffer, *Leviathan and the Air-Pump, passim.*

> the whole Company has been fully satisfi'd of the certainty and constancy; or, on the otherside, of the absolute impossibility of the effect. This critical, and reiterated scrutiny of those things, which are the plain objects of their eyes; must needs put out of all reasonable dispute, the reality of those operations, which the Society shall positively determine to have succeeded . . . their dissentings will be most thankfully receive'd if they be establish'd on solid works, not only on prejudices or suspicions.[17]

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[15] Sprat, *History*, pp. 23-38.

[16] *Ibid.*, pp. 91-92

[17] *Ibid.*, p. 99. This is not to claim that disagreement did not and could not exist, but rather that a specific rhetoric was employed to legitimate Royal Society methodology on the basis of its potential to manage conflict. See Shapin and Schaffer, *Leviathan and the Air Pump*, pp. 55-65; for the use of rhetoric in the Royal Society , see Dear, '*Totius in Verba*: Rhetoric and Authority in the Early Royal Society', *Isis* 76 (1985), pp. 145-161.

The Royal Society, therefore, explicitly identified the methods and practices of natural history as the best and safest means for acquiring new knowledge while at the same time avoiding philosophical disagreements. Natural histories were crucial for the success of a reformed natural philosophy as they would avoid the pitfalls of philosophical dogmatism, serve to confirm the information of the senses, and avoid controversy. In sum, natural history was seen to fulfill the fundamental ambitions of the Royal Society.

Historiae

In its public declarations, the Royal Society stressed the practice of natural history as a model for dispute resolution in Restoration society. However, the understanding that natural historical methods provided the most uncontentious and appropriate means of discovering new knowledge of nature was not mere rhetoric. This belief rested on radical reforms in observation which, by 1660, were already assumed to be the most credible method of obtaining probable knowledge of things.[18] The problem of what constituted philosophically valid, causal knowledge of the real structures of nature and how it was achieved was perhaps the crucial issue in all aspects of early modern natural philosophy.[19] Recently, Peter Dear suggests that the Boylean experimental program at the Royal Society, that is, a method characterized by attempts to legitimate the singular experimental event, was anomalous in terms of accepted conventions for experience and experiment elsewhere in contemporary Europe. Dear was concerned with the challenge of making universal knowledge claims about the natural world on the basis of experimental, mathematically described events.[20] On the continent, what counted as knowledge was the Scholastic notion of universal experience: how things are, or how things behave for the most part. Natural history was similarly concerned with the universal validity of experiential knowledge claims, and especially in the life sciences are evident in a strong tradition of medical thought and practice. In England, epistemological developments rested primarily on the observational and demonstrative program of William Harvey.[21] Indeed, perhaps *the* epistemological discovery of the seventeenth century is that experiential, demonstrative knowledge based on individual observation, epitomized by Harvey's method and capturing the methodological principles of natural history, came to be viewed as legitimate in its own right.[22] Some Fellows, for instance Joseph Glanvill, were explicit in aligning the Society with the Harveian program, since "of all the Modern Discoveries wit and industry have made in the Oeconomy of Human Nature, the noblest is that of the circulation of the blood, which was the invention of our deservedly-famous

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[18] Shapin, *The Scientific Revolution*, p. 187.

[19] Peter Barker and Bernard R. Goldstein, 'Realism and Instrumentalism in Sixteenth Century astronomy: A Reappraisal', *Perspectives on Science* 6 (1998), pp. 232-258.

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[20] Peter Dear, *Discipline and Experience: The Mathematical Way in the Scientific Revolution* (Chicago and London: University of Chicago Press, 1995), esp. with respect to Boyle's program pp. 210. Dear was primarily concerned with the mathematical practices established by the Jesuits. On the constitution of mathematical demonstration at the Royal Society, see also Douglas M. Jesseph, *Squaring the Circle: The War between Hobbes and Wallis* (Chicago and London: The University of Chicago Press, 1999).

[21] Roger French, *William Harvey's Natural Philosophy* (Cambridge University Press: Cambridge, 1995); Andrew Cunningham, 'William Harvey: The Discover of the Circulation of the Blood', *Man Masters Nature: 25 Centuries of Science*, ed. Roy Porter (New York: George Braziller, 1987), pp. 64-76; and Robert G. Frank Jr., *Harvey and the Oxford Physiologists: Scientific Ideas and Social Interaction* (Berkeley: University of California Press, 1980).

[22] Andrew Wear, 'William Harvey and the 'Way of the Anatomists', *History of Science* 21 (1983), pp. 223-249.

Harvey."[23]

Harvey inherited the Aristotelian sensibility towards experience and the Harveian legacy to the new philosophy of the seventeenth century included a prominent role for *historia*, the demonstrable and repeatable knowledge of the senses. The Greeks, especially Aristotle and his followers, had been concerned with *historiae*, those things which were worthy of note in the natural world, acquired through empirical methods and were significant in the philosophical acquisition of knowledge.[24] Aristotle's conception of *historiae*, and especially his emphasis on seeing for oneself, had survived the Middle Ages and Renaissance to form part of the scholastic framework for understanding nature.[25] *Historia*, or analytical description, came before the search for causes or the resolution of doubt; it was the first and primary stage in acquiring knowledge, but it was not merely a 'causeless narrative' of phenomena. Rather *historiae*, arising from repeated *autopsia*, observation and analysis, were seen to be a means of discovering universally valid statements about nature. Because *historiae* rested on empirical methods, it could provide more certain knowledge than *scientia*, which was a matter of theory and speculation. In addition, *historiae* could be attained without being directly related to any particular doctrine, system or philosophy,[26] an advantage in any attempt to present natural philosophy as a neutral activity in religion and politics.

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[23] Glanvill, *Plus Ultra*, p. 5.

[24] French, *Ancient Natural History*.

[25] Andrew Cunningham, *The Anatomical Renaissance: The Resurrection of the Anatomical Projects of the Ancients* (Aldershot: Scholar Press, 1997).

[26] French, *William Harvey's Natural Philosophy*, pp. 310-386.

Many who developed a deep concern with matters of natural history also shared the education and experience of the learned medical tradition but it is worth emphasising the numerical and intellectual importance of medical practitioners at the Royal Society.[27] For example, Christopher Merrett, a physician particularly active in the early years of the Society, was also a fellow of the Royal College of Physicians, and in fact had been nominated by his friend William Harvey to be the custodian of Harvey's library and museum at the College.[28] Merrett understood an intimate relationship between the physician and natural historian and claimed "the word Physician, derived from the Greek . . . is plainly and fully rendered by the word *Naturalist*, one well vers'd in the full extent of Nature and Natural things." This was because a physician required all the skills which have been normally attributed to natural historians, and as such needed to possess the first hand, experiential knowledge of nature in the practice of his art.[29] Natural historical knowledge thus functioned to provide knowledge of the human body as well as the *materia medica* of the physician. Merrett enumerated some of the particulars he believed essential for the practice of medicine in his *Pinax Rerum Naturalium Brittanicarum* (1666 and 1667), 'collected at his own expense', which included plant simples, animals, birds, fish, insects, fossils, minerals and more.[30]

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[27] Harold J. Cook, 'Physicians and natural History', *Cultures of natural history*, ed. N. Jardine, J. A. Secord and E. C. Spary (Cambridge: University of Cambridge Press, 1996), pp. 91-105, esp. p. 103-104; Michael Hunter, *The Royal Society and its Fellows*, pp. 22-32.

[28] Michael Hunter, *The Royal Society and its Fellows*, pp. 36, 138-139; *D NB*, vol. 13 pp. 288-289. Merrett was official custodian until Harvey's library was destroyed in the fire of 1666.

[29] Cook, 'Physicians and natural history', pp. 91-105.

The skills and expertise of the '*Naturalist Physician*' are exemplified in similar patterns of demonstration for diagnosing and treating disease, based on careful observation, true causes *and* careful *historiae*.[31] For instance, Thomas Sydenham's writings on clinical medicine exhibit this approach and were influential for medical practice during the period. Although not a Fellow of the Royal Society, Sydenham was nevertheless a friend of Robert Boyle and much of his work was reported to the Society. For his clinical histories, Sydenham advocated "writing the history of a disease, [in which] every philosophical hypothesis whatsoever, that has previously occupied the mind of the authors, should lie in abeyance. This being done, the clear and natural phenomena of the disease should be noted - these and these only. They should be noted accurately, and in all their minuteness." Then, and only then, could treatment begin "which has been based and built upon sufficient experience, and has in that manner been proved competent to the cure of this or that disease . . . I require that they be shown to succeed universally, or at least under such and such circumstances."[32]

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[30] Christopher Merrett, *Pinax Rerun Naturaliam Brittanicarum continens Vegetablilia, Animalia & Fossilia, in hoc insula reperta, Inchoatus,* (London, 1666, 2nd ed. 1667). Merrett also chose to privilege those authorities in the Royalist and Anglican establishment who have come to be associated with 'proper' and orthodox natural history. In addition to collectors such as Mr. Brown of Oxford and Mr. Bobart Jr. of the Oxford Physic Garden, Merrett acknowledged all of the 'respectable' botanical authorities mentioned by John Ray in the *Catalogus Cantabrigiam*, including 'Mr. Stonehouse', 'Mr. Goodyer', 'Mr. Morgan', 'Mr. Heaton', 'Dr. Bowles' and 'Mr. Willoughby' as well as Ray, although Ray himself unflatteringly referred to the work as "Merrett's bungling *Pinax*". The work was also praised by Oldenburg in the *Phil.Trans*. for initiating the much desired and highly useful commerce among *Naturalists*, and to contribute every where to the composing of a genuin [sic] and full *History of Nature*." *Philosophical Transactions*, December 1666, No. 20 pp. 364-365

[31] Barker and Goldstein, 'Realism and Instrumentalism' p. 244-245. An excellent and early example of the 'natural historical' approach may be found in *Thomas Willis's Case Book (1650-52)*, ed. Kenneth Dewhurst (Oxford: Sandford Publications, 1981). Willis, a friend of Robert Boyle and member of his circle at Oxford, was Sedleain Profession of Natural Philosophy and twice elected as Fellow of the Royal Society (1661) and (1663)

Nehemiah Grew's Natural History Project

The Royal Society's appeal to gentlemen 'curiosi' and 'virtuosi' for patronage and support is well known.[33] The young Society also acted in the capacity of a direct sponsor for Nehemiah Grews' natural historical research project, albeit after the initial year the Society's financial support was somewhat *ad hoc*. The published report of this undertaking was *The Anatomy of Plants* (1682), preliminary portions of which had earlier been presented before the Fellows of the Royal Society and separately published.[34] Known as one of the most important 'botanical' works of the seventeenth century[35], Grew's work is important as an example of the unique approach to natural history developed at and sponsored by the Royal Society in the tradition of Harveian *historiae*. It is true that plant physiology and development were ongoing concerns for many fellows of the Society.[36] Further, the Society had encouraged an array of natural history activities, including the employment of the collector Thomas Willisel,[37] and the publication of Marcello Malpighi's *Anatome Plantarum* (1675 and 1679) as well as Robert Hooke's *Micrographia* (1665) and John Ray's several catalogues of botanical observations.[38] However, Grew's project, according to Hunter, is the first research programme directly sponsored by the institution, and as such is important for our understanding of the particular approaches and orientation endorsed by the young Society.

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[32] Thomas Sydenham, 'Medical observations concerning the history and the cure of acute diseases' 3rd ed., *The Complete Works of Thomas Sydenham*, trans. From the Latin Edition of Dr. Greenhill by R. G. Latham (London: The Sydenham Society, 1848, special edition rept. Birmingham, Alabama: The Classics of Medicine Library, 1979), pp. 14-17. On Sydenham, see also Donald G. Bates, *Thomas Sydenham: the development of his thought. 1666-1676* (Unpubl. PhD Thesis, Baltimore: Johns Hopkins University, 1975); Kenneth Dewhurst, *Dr. Thomas Sydenham (1624-1689): His life and original writings* (Berkeley: University of California Press, 1966); and Latham, R. G., *The Works of Thomas Sydenham, MD., with a life of the author* (London: The Sydenham Society, 1848).

[33] Daston and Park, *Wonders and the Order of Nature*, pp. 215-225; Katie Whitaker, 'The culture of curiosity', *Cultures of Natural History*, ed. N. Jardine, J. A. Secord and E. C. Spary (Cambridge, etc.: Cambridge University Press, 1996), pp 75-90; Michael Hunter, 'Between Cabinet of Curiosities and Research Collection: The History of the Royal Society's repository', *Establishing the New Science*, pp. 123-155.

[34] Grew called the work a 'phytological history'. Nehemiah Grew, *The Anatomy of Plants with an Idea of a Philosophical History of Plants, and several other Lectures read before the Royal Society* (London, 1682). Grew's early report was presented to the Society 10 December 1674; see Birch *History of the Royal Society*, p. 161.

[35] Michael Hunter, 'Early Problems in professionalizing scientific research: Nehemiah Grew (1641-1712) and the Royal Society, with an unpublished letter to Henry Oldenburg', *Establishing the New Science*, pp. 261-278; Jeanne Bolam, 'The Botanical Works of Nehemiah Grew, FRS (1641-1712)', *Notes and Records of the Royal Society* 27 (1973), pp, 291-231; D. R. Metcalf, 'Nehemiah Grew', *Dictionary of Scientific Biography*, ed. C. G. Gillispie, vol 5 (New York, 1970), pp. 534-536.

Grew's achievement was a morphological and physiological study of plants, which he claimed to be his attempt at "managing this Part of Natural History."[39] By 1682, Grew was an honorary Fellow of the Royal College of Physicians as well as a Fellow of the Royal Society and he made direct appeal to established practice in scholarly medicine and especially the Harveian tradition in natural philosophy to justify his methods. Grew credited the inspiration to study plants to Francis Glisson, a Fellow of the Royal Society, but also Regius Professor of Physic at Cambridge where he had begun demonstrating Harvey's discovery of the circulation of the blood as early as 1639.[40] One of Grew's declared ambitions, as well as a concern of the Society, was also to describe the circulation system of the plant.[41] *The Anatomy of Plants* recalled the Harveian legacy of the circulation of the blood and suggested a metaphorical similarity between the physical structures of plants and animals. Grew claimed "that a plant, as well as an Animal, is composed of several Organical Parts . . . That every plant hath bowels of divers kinds, containing divers kinds of liquors. That even a Plant lives partly upon Aer; for the reception thereof, it had those Parts which are answerable to Lungs, so that a Plant, as it were, is an Animal in Quires, as an Animal is a Plant, or rather several Plants bound up into one volume."[42]

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[36] See, among others 'Mr. Daniel Coxe's inquiries concerning vegetables' April 19, 1665, *The History of the Royal Society*, pp. 32-40; 'An experiment on Aloe Americana Serrati-folia weighted; seeming to import a Circulation of the Sappe in Plants, by the same Dr. Merrett', *Philosophical Transactions*, No 25; May 6, 1667, pp. 455-457; 'A suggestion for taking more notice, than hath been done formerly, of the Juyces of Trees, by tapping them', *Philosophical Transactions* no. 40, October 19, 1668 pp. 801-802; 'Dr. Ezreal Tonge and the Sap of Trees', *Philosophical Transactions* No. 43, January 11, 1668/69; and No. 44, February 15, 1667/68; 'A discourse on the seeds of plants', December 17, 1674, Birch *History of the Royal Society*, vol. III, pp. 162-169; 'A discourse on the specific differences of plants' *ibid* pp. 169-173.

[37] In 1668, Willsell was employed at a salary of thirty pounds a year to collect plants, birds and fishes; Thomas Birch, *History of the Royal Society for Improving of Natural Knowledge*, ed. Thomas Birch, vol. III (London 1756-57 rpt. Hildesheim, George Olms, 1968), Vol II, pp. 377-378.

[38] Including Ray's *Catalogue Plantarum Angliae et, insularum adjacentium* (London 1670 and 1676); *Catalogus stirpium in externis regionibus* (London, 1673); *Observations topographical, moral and Physiological...with a catalogue of plants not native of England found spontaneously growing in those parts, and their virtues* (London, 1673); and, Francis Willoughby's *Ornithology*, ed. John Ray, (London, 1676).

[39] Grew, "The Preface", *The Anatomy of Plants*, sig. a.

Grew's research project closely resembled the program of Aristotle's student and successor at the Lyceum, Theophrastus, which of course was grounded upon the *historiae* of plants.[43] In the *De Causis Plantarum,* Theophrastus had been especially concerned with *vegetatio,* the growth, maintenance and reproduction of the plant in general, and in

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[40] French, *William Harvey's Natural Philosophy*, p. 376.

[41] Grew also described the bleeding which occurred in all plants as "the eruption of the Sap out of any Vessels", which however could occur in either direction, since "in the Sap Vessels of a plant, there are no Valves"; Grew, *The Anatomy of Plants*, pp. 125-126.

[42] Grew, 'The Epistle Dedicatory', *The Anatomy of Plants*, np; Grew's dedication also imitated William Harvey's, whose book announcing his discovery of the circulation of the blood in animals had been offered to Charles I.

[43] For a discussion of Harvey's Aristotelian project, see Cunningham, 'William Harvey: The Discoverer of the Circulation of the Blood'.

Aristotelian terms the essential part of the plant was the stem as the organ of nutrition and the material form of the nutritive soul. Further, Theophrastus was trying to make universal, scientific statements about all plants.[44] In a similar manner, Grew investigated the plant in order to make statements which were true of all plants. In particular, Grew asked questions about the role the various parts had in the life of the plant, and why such parts were necessary for that life. He was concerned to discover the purpose, or final cause, in the functioning of all the parts of the plant: he studied the roots, the leaves, the seeds, but as well the internal structures, the generation and the growth of plants. Grew was also concerned to justify his research for its potential to classify plants, again taking his programmatic statements from Theophrastus, "since the present Design will ingage us to an accurate and multifarious observation of Vegetables, we may hereby be enabled to range and sort them with more certainty, according to the degrees of their affinity."[45] However, with the caution we have come to associate with many of the public endorsements made by Fellows of the Royal Society, Grew avoided endorsing any specific philosophical opinion. Grew's explanations omitted Aristotelian virtues and qualities but also explanations framed within the equally suspect mechanical philosophy. Not only did he refrain from adducing causes in terms of the movement of little particles but also worried, "if any of the Principles or Discourses of Cartesius, Gassendus, or others about material Causes, may, upon a right Judgement made, be found culpable, I am not about to answer them."[46]

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[44] Theophrastus, *De Causis Plantarum*, trans. Benedict Einarson and George K. K. Link, Three Volumes (London and Cambridge MA: William Heinemann and Harvard University Press rpt. 1976); Theophrastus, *Enquiry into Plants and Minor Works on Odours and Weather Signs(Historia Plantarum)* trans. Sir Arthur Hort Two Volumes (Cambridge MA and London: Harvard University Press and William Heinemann rpt. 1948), Bk. I.

[45] Nehemiah Grew, *An Idea of a Phytological History of Plants read before the Royal Society, January 8 and January 15, 1672* (London, 1672), p. 8 (and reprinted in the *Anatomy of Plants with an Idea of a Philosophical History of Plants*, London 1682). Classification had also formed part of the Theophrastan program; see Theophrastus, *Inquiry into Plants.*

As a part of natural philosophy, *historiae* were also knowledge that was in some sense demonstrated. In fact, *historiae* could only function adequately as knowledge if it convinced others of the validity of the observations. Grew's strategies to persuade his audience are all we have come to expect of proper seventeenth-century natural philosophy. He emphasised the universal nature of his statements by claims of repeated and repeatable observations. In his discussion of the seeds of plants, for instance, he used the exemplar of the great Garden-bean for its size and convenience, but claimed "an ocular inspection in hundreds of other seeds, even the smallest" confirmed the universality of his observations for all such seeds.[47] To convey the complexity of the subject where words were not fully adequate, Grew provided visual aids, diagrams and illustrations for the reader to compare with the text and with one's personal observation. In a number of cases he also provided directions for simple demonstrations, as in his instructions for studying the motion of sap.[48] Grew also reported confirmation by other observers; however, the strategy was more than just providing a distinguished audience of credible witnesses.[49] Rather Grew appealed to an expert, learned audience to validate his research, what Roger French would call a 'competent jury'.[50] Grew claimed his research had been confirmed "both by our Learned Countrey-men Dr. Wallis and Mr. Lister," but the "truth of these Observations" was also independently corroborated by recognized experts throughout Europe including "Seignior Malpighi," "the Ingenious Mr. Lewenhoeck," and "Mons. Le Vasseur, an Ingenious Gentleman in Paris."[51]

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[46] Grew, 'The Preface', *A Phytological History*, np

[47] Grew, *The Anatomy of Plants*, p. 6.

[48] *Ibid.*, p. 126.

[49] For studies on 'credible witnesses' see Shapin, *A Social History of Truth;* Paula Findlen, *Possessing Nature*, pp. 194-240; and Schaffer and Shapin, *Leviathan and the Air Pump.*

Grew's work on plant physiology, by and large, was accepted and incorporated into the wider knowledge domain for natural history as it was developing in the latter seventeenth century.[52] As historians we have come to accept that a thing is believed to be true not just because it is demonstrably true and repeatable, but also through negotiation, reputation or other social mechanisms. It is therefore legitimate to ask how or why consensus was achieved within Grew's own community. In fact, Grew was so successful, that his natural history project was seen by many contemporaries to be fully complete with no need for a continuing research program into plant anatomy. The *Anatomy of Plants* fully captured the metaphysical, epistemological, and methodological concerns of the Royal Society and Grew's success in achieving acceptance of his research may, at least in part, be attributed to the fact that he was also working within the natural history tradition. By 1682 when Grew's *Anatomy of Plants* was printed, the Society's support for an array of natural historical activities was unquestionable. Natural history, as we have seen, was precisely the approach for investigating natural knowledge that was endorsed by the Royal

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[50] French, *William Harvey's Natural Philosophy*, pp. 338-341.

[51] Grew, 'The Preface', *The Anatomy of Plants*.

[52] John Ray, for instance, would disagree with Grew's conclusions about the movement of sap in trees, but otherwise incorporated much of Grew's work into his own *Historiae Plantarum* (London, 1686).

Society and which was seen to be socially useful in Restoration society.

Grew, however, also had a serious handicap in that he was an Anglican nonconformist, a minority position within the Royal Society and the politically incorrect posture for respectability in 1682. Grew was therefore careful to neutralize this disability and follow the Royal Society in publicly professing loyalty to the Crown, whatever his personal convictions. Not only did he dedicate the *Anatomy of the Plants* to Charles II, but he explicitly declared his "Good Affection toward His Majesty, His Crown and Dignity."[53]

We must not underestimate the importance of this strategy as a persuasive to Grew's personal loyalty, or its political impact as a statement of Royal Society orthodoxy. During 1680-82, the stability of the English crown was under renewed threat, and in his attempts to address the situation the King had dissolved the long-lived Cavalier parliament and reconvened three separate parliaments to avert the crises. A Whig faction within parliament was attempting to exclude the Catholic James Stuart from taking the throne at his brother's death. Among the leaders of the opposition faction were individuals, such as the Earl of Shaftesbury and Algernon Sydney, who sought to crown Charles's illegitimate son, James Scott, Duke of Monmouth. Charles's ultimate victory in the Oxford Parliament of 1681 was supported by much royalist propaganda, including John Dryden's brilliant *Absolom and Achitophel* (1681) in which Charles was compared to King David and Shaftesbury and his adherents were portrayed as unscrupulous adventurers.[54] Thus by July 1682, when Shaftesbury had fled to Holland to escape charges of high treason, it would have been politically astute for both Grew and the Royal Society to make clear declarations of their loyalty to the crown.

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[53] Sprat, *History of the Royal Society*, p. 136.

Conclusion

The unique and culturally specific methods of natural history developed at the Royal Society were historically rooted in the circumstances of Restoration England, and undoubtedly were dependent upon the education, interests and curiosities of the active Fellows. The methods of the naturalists which were promoted by the Royal Society were fundamental to the Society's ambitions to establish a new philosophy of nature but were also seen as the best and safest way for acquiring new knowledge. At the same time the methods of natural history were also important for avoiding contention and controversy in society more generally. Natural history incorporated a variety of methods and topics, and was defined very broadly at the Royal Society to include the majority of the activities of the early institution. Fundamentally, natural history was conceived as *historiae,* and represented a concern with how things are, or how things behave for the most part as well as paying attention to the universal validity of experiential knowledge claims.

The Royal Society sponsorship of Nehemiah Grew's natural history project was part of its ongoing concern with plant development and physiology. Grew worked within a strong natural history tradition in the life sciences arising from established medical approaches and practices, and Grew's example illustrates that there was no one dominant paradigm for investigations into nature at the Royal Society. Rather, the Society accepted a variety of methods to understand the natural world under the umbrella of natural history. Further, natural history consisted of an array of activities which constituted fully appropriate and legitimate methods for the enterprise during the 1660 and 1670s. Finally Grew, as well as the Royal Society, continued to deem it expedient to align themselves with dominant loyalist interests within society to legitimate their activities.

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[54] Roger Lockyer, *Tudor and Stuart Britain 1741-1714,* 2nd ed. (Harlow, Essex: Longmans, 1985) pp. 341-349; Winn, *John Dryden and his World,* pp. 33-380.

CHAPTER 6

Inventing Identities 1662-1680

> "I should like to enter a plea that men of University standing to whom God has given leisure, and a suitable education and intelligence, should spare a brief interval from other pursuits, and, without in any way neglecting their other studies, that they should develop the habit of examining Nature, and compile a comprehensive account of its creatures"[1]

In 1662, Ray was an unknown scholar who had severed his association with Cambridge University and disqualified himself from a profession in the Church. Moreover, Ray, the blacksmith's son from Black Notley and 'sometimes Fellow of Trinity College', entirely lacked the social standing and credibility required to assume an authoritative role in the construction of respectable knowledge in the seventeenth century.[2] Although his *Catalogus Cantabrigiam* seems to have been popular enough to merit a short *Appendix ad Catalogum* (Cambridge, 1663),[3] Ray's prospects for continuing his natural history project were uncertain. True, after 1662 Ray was successful in having several books printed, but publishing success in the seventeenth century was a risky undertaking and by no means represented either social or financial success. Further, Ray's output was varied and reflected the interdisciplinarity we have come to expect of seventeenth-century

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[1] Ray, 'Preface to the reader', *Ray's Flora of Cambridgshire*, p. 26.

[2] See for instance, Steven Shapin, *A Social History of Truth* (Chicago: University of Chicago, 1994).

[3] John Ray, *Appendix ad Catalogum plantarum circa Cantabrigiam nascentium continens addenda et emendanda* (Cambridge, 1663).

virtuosi. Ray prepared the plant classification tables for John Wilkins's *Essay for a Real Character and Philosophical Language* (1668). He published a dictionary, a collection of proverbs and accumulated a vocabulary of British dialects.[4] Under the auspices of the Royal Society, Ray's narrative of his European grand tour with Francis Willughby and Philip Skippon was printed, and he also organized and edited Willughby's Latin *Ornithologie* (London 1676), and translated it for an English edition (1678). Only two publications exhibit an exclusive concern with the study of plants: the *Catalogus Plantarum Angliae* (London, 1670 and 1677) and the *Catalogus Stirpium in exteris regionibus* (London, 1673), both printed by the Royal Society printers. Nevertheless by 1682, Ray was known as "the best botanist and most accomplished naturalist, of this, or perhaps any, age."[5] Neither Ray's role as a creditable spokesman for natural philosophy, nor the knowledge he was engaged in creating was self-evident or inevitable. Rather, Ray's status required a determined and self-conscious effort to construct and maintain. What follows is an analysis of how Ray successfully translated his identity from an anonymous Fellow of Trinity College to that of a respectable gentleman with a leadership role on matters of natural history.

Ray's social identity is intimately linked to his deliberate and self-conscious construction of a community of natural historians. Intellectual activity occurs within a social community which justifies, legitimates and is persuaded by the production of new knowledge. It is therefore important to understand Ray's personal network which preserved those aspects of his enterprise which represented the 'values, aims and norms' of the Restoration Anglican community, as well as the social milieu in which the practices and concepts of natural history were entrenched. This chapter explores the community of natural historians which was constructed by Ray, participated in his natural history projects and was sustained by his efforts during the 1660s and 1670s.

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[4] John Ray, *A Collection of English Proverbs* (Cambridge, 1670); Ray, *A Collection of English Words Not Generally Used* (London, 1674); Ray, *Dictionariolum Trilingue* (London, 1675).

[5] Letter from Tancred Robinson, 10 September 1683, *Correspondence of John Ray consisting of selections from the philosophical letters published by Dr. Derham*, ed. Edwin Lankester (London: Ray Society, 1848, rpt. New York: Arno Press, 1975) p. 135.

INVENTING A 'SCHOLAR AND A GENTLEMAN'

1. Europe 1663-1666

Ray quit Cambridge in 1662 with "the design of travelling hot in my head."[6] In April 1663, leaving his brief employment at Friston Hall with Thomas Bacon, Ray began a European tour with Francis Willughby, Philip Skippon and Willughby's friend Nathaniel Bacon, many details of which are well recounted by Charles Raven.[7] Willughby, Skippon and Ray were companions who shared a commitment to the accurate and circumstantial observation of nature. Willughby had recently been elected to the newly instituted Royal Society of London for the Advancement of Natural Knowledge; in subsequent years Ray and Skippon also would become Fellows. The experiences of credible travellers were eagerly sought by the Royal Society, both for the expansion of natural knowledge and for verification of existing reports of natural phenomena.[8] The Society was also happy to exploit the presence of Willughby's party in Europe for these purposes. At a meeting of the Royal Society in March 1664, John Wilkins proposed

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[6] Letter to Peter Courthope, 4 September 1662, *Further Correspondence of John Ray*, ed. R. W. T. Gunther (London, Ray Society, 1928), p. 32.

[7] Charles Raven, *John Ray, Naturalist: His Life and Works* 2nd edn (Cambridge, etc.: Cambridge University Press, 1950, rpt. 1986), pp. 111-141.

> that Mr. Francis Willughby, a Fellow of the Society, and Mr. John [W]ray, now both in Italy, and intending for Spain, might be desired to pass from Cadiz to Teneriffe, and there make those experiments and observations formerly directed by some members of the Society, and recorded in their books. This motion was well approved, and the proposer desired to write to Mr. Willughby and Mr. [W]ray to that purpose, and to send them a copy of those directions as they are registered, together with the apparatus of instruments for such performances.[9]

In the event, however, only Willughby and Bacon travelled to Spain; Ray completed the tour following a different itinerary with Skippon. The Royal Society would later print Ray's complete account of their travels as *Observations topographical, moral & physiological made in a journey through part of the low-countries, Germany, Italy, and France . . . Whereunto is added a Brief Account of Francis Willughby Esq.; his Voyage through a great part of Spain* (London, 1673).

More generally in the seventeenth century, travel on the Continent provided individuals with the opportunity to enhance their collections and 'cabinets of curiosities' by the acquisition of rarities not readily available in England. Travel was also seen by many gentlemen as an important means for expanding education and knowledge.[10] Ray and his party for instance, not only spent the winter of 1664 anatomizing at the University of Padua and the autumn of 1665 botanizing at Montpelier, but Ray's account itemizes the many private museums and gardens they visited, especially important features of the philosophical culture in early modern Europe.[11]

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[8] D. Cary, 'Compiling Nature's History: Travellers and travel narratives in the early Royal Society', *Annals of Science* 54 (1997), pp. 269-292.

[9] Thomas Birch, *The History of the Royal Society of London for Improving of Natural Knowledge*, Vol. I (London 1756-1757, rpt. Hildescheim: George Olms Verlagsbuchandlung, 1968), pp. 393-394.

[10] Robert Iliffe, 'Foreign Bodies: Travel, Empire and the Early Royal Society of London. Part I. Englishmen on Tour', *Canadian Journal of History* 33 (1998), pp. 357-385.

We should not underestimate the cultural and social implications of European travel, and especially its role for validating social standing. During the seventeenth century, the European grand tour was becoming part of the privileged experience of a young and elite class of English gentleman; indeed, the experiences of foreign travel may have served specific purposes for constructing the identity of the English gentleman and scholar.[12] We may expect that Ray's personal reputation for 'civility' and 'credibility' among his own countrymen to have been enhanced by his European opportunity. In fact, his published account of the travels identified a privileged readership of "those who may hereafter travel the same places with like design."[13] Beyond its importance as a creditable account of the European experience, Ray's *Observations* was a gentlemanly narrative of travel within a circumscribed circle of gentlemen. Philip Skippon's account of their journey, printed in 1732, especially suggests the range of travelling English society, from students to diplomats, scholars to aristocrats. "Englishmen in Rome when we were there," Skippon wrote of a typical port of call,

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[11] John Ray, *Observations topographical, moral & physiological made in a journey through part of the low-countries, Germany, Italy, and France with a catalogue of plants not native of England found spontaneously growing in those parts, and their virtues. Whereunto is added A brief Account of Francis Willughby Esq; his Voyage through a great part of Spain* (London, 1673); Philip Skippon, *An Account of a Journey Made Thru' Part of the Low-Countries, Germany, Italy and France by Philip Skippon Esq: afterwards knighted, in company with the celebrated Mr. Ray* (London, 1732).

[12] Iliffe, 'Foreign bodies', p. 385.

[13] Ray, 'The Preface', *Observations Topographical, moral and physiological, Sig. A2 - A2v.*

> Mr. James Oxinden, Mr. James Palmer, Mr. Hudson a Roman Catholic, Mr. Edward Albertam a Roman Catholic, Mr. Broome an English merchant, kept house here. Mr. [Henry] Compton since bishop of Oxford and bishop of London, Mr. Waters, Mr. [Andrew] Paschal, Mr. Laur. Threele, Mr. Golding, Mr. Lawthen, Mr. Farwell, Mr. Jeanes one scholar of the house at Trinity College in Cambridge, and lately fellow of Magdalen-College in Oxford, Dr. Paman fellow of St. John's in Cambridge, Mr. [Barnham] Soames. Earl of Sunderland; lord Castlemaigne, lord Hinchinbrooke the earl of Sandwich's son; Sir Edward Stadling; Mr. Henry Savil; Mr. Wormly, Mr. Slingsby Bethel; Mr. Steel, once recorder of London; Mr. Townley; Dr. Gibbs, who formerly practised physick, but now devotes himself to poetry, and is lately made professor of humanity in the Sapienaz...Thomas Normington, who calls himself father Leander, a Benedictine Fryar; Mr. [Thomas] Brown, Dr. Brown of Norwich's son; Mr. Trumball, fellow of All-Souls in Oxford....Somerset is one of the oratorians at Rome; Mr. Noell, lord Cambden's eldest son; Mr. Skippwith. The rector of the English jesuits-college his name is Anderton. One Anderton waited on Cardinal Carlo Barberino. One Sands in the duke of Brunswick's retinue.[14]

In addition to the more easily appreciable educational and acquisitive aspects therefore, European travel offered less measurable but no less important benefits of social validation.[15] Further, the tour also facilitated the acquaintance of many Englishmen who became friends as well as contributors to Ray's natural history projects, including the Roman tourists Henry Compton, Barnham Soames and Andrew Paschall. Other future contributors encountered in Europe included Percival, Francis Willughby's uncle, Francis Jessop a contemporary of Ray and Willughby at Trinity College, and importantly Martin Lister formerly of St. John's College Cambridge.[16]

The continental tour also enabled Ray to form connections with a European republic of letters. While this aspect of the tour complemented the Royal Society's ambitions to become an international centre for the exchange of information,[17] Ray himself was not a Fellow of the Society until 1667, so that we may expect that the interests served and the relationships formed may not have been on the Society's behalf. Ray went botanizing with Hieronymous, professor at the University of Basel who was the son of the famous Swiss physician and botanist John Bauhin.[18] He visited a Dr. Hoffman at the physic garden in Altors, possibly the Hoffman designated "*in Academia Altorsiana publici Professoris primarii*', and author of *De Medicamentis Officinalibus tam simplicibus quam compositis* (Paris 1646) in Ray's *Catalogus Cantabrigiam*.[19] At Naples the company was present at the meeting of the Philosophic Academy, and Ray became acquainted with Dr. Thomas Cornelius, professor of mathematics and physics, "who hath made himself known to the world by his writings" and who also became an occasional correspondent and acknowledged contributor to Ray's *Catalogus Angliae* (1670, 1677).[20] At Rome, they met the renowned polymath Athanasius Kircher whose works Ray would later cite, as well as receiving a personal tour in Kircher's natural history gallery.[21] Finally, at Montpelier they met the natural philosopher Nicholas Steno, soon to become a personal physician to Grand Duke Ferdinand II de Medici in Florence, and the well-known botanist Pierre Magnol.[22]

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[14] Skippon, *An account of a Journey*, p. 633. Ray was already acquainted with Thomas Browne from Trinity College Cambridge, but Compton, Paschal, and Soames, as well as as Martin Lister and Francis Jessop, would later contribute to Ray's natural history enterprise.

[15] Iliffe, 'Foreign bodies', p. 384-385.

[16] *Ibid.* Jessop and Lister were at Montpelier in August 1664 when Ray and Skippon visited. Willughby and Bacon had parted company with Ray by then; see Skippon, *An Account of a Journey*, p. 609.

[17] Iliffe, 'Foreign bodies', pp. 357-385.

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[18] Ray, *Observations*, p. 98; Skippon, *An Account of a Journey*, p. 446.

[19] Skippon, *An Account of a Journey*, p. 468; Ray, *Catalogus Cantabrigiam*, sig. **4.

[20] Letter from Dr. Cornelli, December 1663, *Correspondence of John Ray*, p. 6; Ray, *Observations*, p. 271; Ray, *Catalogus Plantarum Angliae*, p. 118; Skippon, *An Account of a Journey*, p. 607.

[21] Skippon, *An Account of a Journey*, p. 672; Paula Findlen, 'The Janus Faces of Science in the Seventeenth Century: Athanasius Kircher and Isaac Newton', *Rethinking the Scientific Revolution*, ed. Margaret J. Osler (Cambridge: Cambridge University Press, 2000), pp. 221-246.

[22] Skippon, *An Account of a Journey*, pp. 714-715; Raven, *John Ray, Naturalist*, p. 137.

The benefits of personal interaction among an international philosophical community are vital but difficult to calculate. Twenty years later, Tancred Robinson, on a similar grand tour of Europe, wrote to Ray "I had several conferences with S. Malphigi at Bononia, who expressed a great respect for you, and is not a little proud of the character you gave him in your *Method[us] Plantar[arum] nov[a]*."[23] Robinson also reported "Monsieur Tournefort, a Languedoc man, and doctor of Montpelier, demonstrates now the plants in the King's Garden here. He speaks with great veneration of you."[24]

Ray's European sojourn provided positive benefits for his future studies in natural history and his reputation as a natural philosopher. Certainly the expansion of his personal knowledge of European plants and the increased opportunities for extending his education in areas such as anatomy are important. The tour also facilitated Ray's entrance into the wider of community of late seventeenth-century natural philosophers, as well as providing an introduction into English society more generally. When Ray returned to England in the spring of 1666, the foundation for his identity as 'a gentleman and a scholar' had been established.

2. *The Search for a Patron*

Patronage, a system of reciprocal social interactions, was well understood by contemporaries.[25] The structures of patronage have been shown to be an especially important feature of early modern natural philosophy, where patrons offered support and protection to their clients in return for enhanced reputation, honour and prestige.[26] Client-patron relationships also operated in the English social landscape throughout the seventeenth century and affected all aspects of social, political and economic life; indeed, the necessity of patronage was commonly accepted by young, university-educated men seeking careers, positions, or improvements to their social and economic status.[27] The social mechanisms which characterize patron and client interactions included ritualized gift giving and formal proclamations of personal honour, love, trust and obligation. The operation of specific patronage relationships was based on an unwritten and indeed, undefinable, contract between two individuals. Loyalty and obedience to a patron were expected in exchange for service, usually of an undefined and ongoing nature. However, the benefits to a client were often uncertain, unpredictable and highly contingent; even successful clients may have enjoyed only insecure tenure.[28]

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[23] Letter from Tancred Robinson, 18 April 1864, *Correspondence of John Ray*, p. 142. Robinson is referring here to Ray's *Methodus Plantarum Nova* (London, 1682).

[24] Letter from Tancred Robinson, July 12, 1683, *Ibid*, p. 133.

[25] Linda Levy Peck, *Court, Patronage and Corruption in Early Stuart England* (London: Routledge, 1990).

Especially after his decision to forego a clerical career within the Anglican church establishment, Ray's best prospect when he returned to England in 1666 was to obtain a patron. During these years, Ray visited Robert Barnham at Broughton, Peter Courthope at Danny, and Thomas Wendy, Willughby's brother-in-law, at Wendy, Cambridgeshire,[29] all landed gentry with the capacity to play the role of a generous patron to a well-educated client. Upon leaving Cambridge in 1662, Ray had briefly 'engaged' himself to Robert Barnham and appears to have corresponded with him from Europe. Barnham (1606-1685) was Commissioner for Assessment in Kent (1660-80), had been Deputy Lieutenant for the county in 1660-63 and would be again in 1672 until his death. Whatever hopes Ray may have had for his association with Barham, however, no correspondence exists after Ray's visit in 1668.[30] Peter Courthope had been Ray's student at Cambridge, and Ray a frequent visitor to the Courthope estate at Danny. Peter had also been proposed as a travelling companion for the European tour, and in 1668 he joined Willughby, Ray and Skippon as a Fellow of the Royal Society. Ray used the formal language of patronage to dedicate the *Collection of English Words* (1673) to Courthope "though I need no other motive to induce me to present you with the Collection of English Words, I might take occasion to publicly own my obligations to you."[31] In 1691, Ray would dedicate his important work on natural theology, *The Wisdom of God Manifest in the Work of Creation* to 'Lady Lettice Wendy of Wendy', Francis Willughby's sister and widow of Thomas. Ray's reasons for his choice of Lettice as patroness, were "first because I owe it to the Liberality of your Honoured Brother, that I have this leisure to write any Thing.

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[26] Paula Findlen, 'Patrons, brokers and strategies', *Possessing Nature*, pp. 346-393; Mario Biagioli, 'Galileo's system of patronage', *History of Science* 28 (1990), pp. 1-62.

[27] Cormack, Lesley B. 'Twisting the Lion's Tail: Practice and Theory at the Court of Henry, Prince of Wales", *Patronage and Institutions: Science, Technology and Medicine at the European Court 1500-1750*, ed. Bruce T. Moran (Rochester: Boydell Press, 1991), pp. 67-83; Peck, *Court Patronage and Corruption*..

[28] The aspiring client, Henry Peacham (1583-1643?) described some hazards of the patronage game in the emblem '*Honos venalis*': "Who seekst Promotion through just desert,/ And thought by gift of body, or of mind,/ To raise thy fortune, whosoere thou art/ This new Impressa take to thee assigned/ To warne the oft, such labour is in vaine/ If heerby thought, thy merit to obtain"; Henry Peacham, *Minerva Britanna* (London, 1612) p. 97.

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[29] Raven, *John Ray, Naturalist*, pp. 142-162.

[30] Letter from Robert Barham, March 13, 1665/66, *Correspondence* pp. 9-11; B. D. Henning, *House of Commons 1660-1690* (London: History of Parliament Trust, 1983), vol. 1, pp. 599-600; Raven appears to be mistaken when he reports Barnham's death in 1668; Raven, *John Ray, Naturalist*, p. 147.

[31] John Ray, 'Epistle Dedicatory', *A Collection of English words not generally used, with their significations and original in two alphabetical catalogues* (London, 1673), Sig. A3.

Secondly, Because also your many and signal Favours, seeing I am not in a Capacity to requite them, seem to exact from me at least a publick Acknowledgement, which such a Dedication gives me an Opportunity to make."[32]

Ray explicitly identified John Wilkins as a friend and patron and in fact had spent considerable time at the Bishops's palace at Chester.[33] The botanical tables for Wilkins' *Essay for a Real Character and Philosophical Language* (London 1668) were prepared by Ray who was also engaged in the effort to translate the entire work into Latin. In the preface to the *Observations Topographical, Moral and Physiological,* Ray tells us that he had intended to acknowledge Wilkins' generosity, however "[a]fter the deplorable Death of that Reverend and Worthy Prelate, John, Lord Bishop of Chester, to whom the Dedication of this was intended" Ray chose instead to honour his European travelling companion Philip Skippon, soon to be knighted by Charles II.[34] Ray's dedication followed the accepted formula of client-patron relations: "several weighty considerations induced me to recommend it to your Patronage. At first, that I might thereby take occasion publicly to own my Obligations to you, and profess my gratitude." Ray also expressed the hope that Skippon's patronage "will gain Reputation to my Book and procure it acceptance in the world."[35] The significance of Ray's acknowledgements is further evident when we consider his practice in other publications. Of the six titles that Ray had printed during the 1670s, only the *Catalogus Plantarum Angliae* (London 1670 and 1677) the *Observations* (1673) and the *Collection of Unusual Words* (1674*)* were dedicated volumes. Another three titles, the *Catalogus Stirpium* (London 1673), the *Dictionariolum Trilingue* (London, 1675) and the *Collection of English Proverbs* (London 1670 and 1678), as well as Ray's first book, the *Catalogus Cantabrigiam* (1660) were undedicated. That Ray knew the obligations and expectations of the patronage relationships is also quite clear in his dedication of the *Miscellaneous Discourses* (London 1692) to an old friend, John Tillotson, archbishop of Canterbury. Tillotson, a contemporary of Ray's at Cambridge and John Wilkins' son-in-law, had invited Ray to accept a clerical position in the Anglican church in 1691, which however Ray had declined.[36] Ray's declaration was explicit that "It was no Interest or Expectation of mine, that induced me to dedicate this Discourse to your Grace . . . My principal motive was, that it would give me opportunity of congratulating . . . your advancement to the Archiepiscopal Dignity."[37] Further, in 1692, Ray's work was an entry into an extremely controversial debate on the theories of the earth, which could only benefit from Tillotson's protection and approval.

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[32] John Ray, *Wisdom of God Manifest in the Works of Creation* (London, 1691), sig. A1-A1*v*.

[33] In the Preface to the *Synopsis Methodica Stirpium Britannicarum* (1690), Ray acknowledged '*Reverendiss. Praesule D. Joanne Wilkins, Episcopo tum Cestriensi Amico & Patrono*", sig. a.

[34] John Venn and J. A. Venn, *Alumni Cantabrigiensis* (Cambridge: Cambridge University Press, 1922-27, rpt. Kraus, 1974-76), Vol. 4, Part I, p. 86.

[35] Ray, 'Dedication', *Observations Topographical, Moral and Physiological,* Sig. A2.

Ray was ultimately successful in his quest to secure patronage. By 1670, he was settled at the Middleton estate, arranging Willughby's extensive collection of European rarities, experimenting with Willughby on the movement of sap in trees which they reported to the Royal Society and assisting his friend on family matters.[38] In 1670, the *Catalogus Plantarum Angliae*, Ray's alphabetical catalogue of British Plants, formally acknowledged his patron, *"Clarissimo Viro D. Francisco Willughby Armigero, Amico & Maecenati suo Plurimum Honorando, Hoc Qualecumque Opusculum Gratio & Devoto Animo Offert ac dedicat."*[39] Ray remained at Middleton after Willughby's death in 1672, and with Philip Skippon, Francis Jessop, and Henry Barnard, Francis's father-in-law, was an executor of the Willughby estate. Francis, however, had intended Ray to continue as a Willughby client. According to Willughby's daughter Cassandra, Francis had "desired that Lady Cassandra [his mother] and [his wife, Emma Willughby] would let Mr. Ray continue in the house to take care of his sons' education, and he left [Ray] an annuity of sixty pounds a year for his life."[40] The pension from Willughby, Ray would later declare, provided "sufficient to support me during life, without being burdensome to my friends; and my condition though not splendid, nor fortune affluent, yet is tolerable enough not to say easy to me."[41]

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[36] Letter to Tancred Robinson, 24 July 1691, *Further Correspondence*, p. 274. Derham provided only an abstract of the letter from Tillotson offering Ray a church living. I have been unable to locate Tillotson's correspondence at the Lambeth Palace Library.

[37] John Ray, *Miscellaneous discourses concerning the dissolution and changes of the world wherein the primitive chaos and creation, the general deluge, fountains, formed stones, sea-shells, found in the earth, subterraneous trees, mountains earthquakes, volcanoes, the universal conflagration and future state are largely discussed and examined* (London, 1692), sig. A3.

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[38] *Report on the Manuscripts of Lord Middleton, preserved at Wollaton Hall, Nottinghamshire* (London: Historical Manuscripts Commission, 1911) pp. 269-271. The document in Ray's handwriting is entitled "Memoirs and observations taken out of old muniments, videlicet deeds, fines, accounts, court roles, and all sorts of old writings which were found the most of them either at Wollaton or Middleton chiefly concerning pedigrees, marriages, titles of land, purchases and sales, sutes in all courts of the familie of the Willughbies."

[39] John Ray, 'Dedication', *Catalogue Plantarum Angliae, Insularum Adjacentium* (London, 1670; 2nd edn London 1677), Sig. A2. "Maecenas" had been the patron of Horace and Virgil and the term 'Maecenati' is used here to designate a patron of literature.

[40] Cassandra Willoughby, Duchess of Chandos, *The Continuation of the History of the Willoughby Family*. ed. A. C. Wood (Eton, Windsor: University of Nottingham, 1958), p. 115. Ray's residence at Middleton ended soon after the death of Francis's mother Cassandra Willughby in 1675 and the remarriage of Emma, Francis's widow, to Josiah Child of the East India Company. Child took legal action to have Willughby's will set aside and the children taken out of Ray's charge. Raven reports that Child declared Ray a nonconformist in the case before Lord Chancellor Heneage Finch, however Raven fails to substantiate this claim. Raven reports, according to a certain unidentified Woodcock, "Whereupon the Chancellor whose opposition to all proposals for toleration was notorious replied that he had rather have his son bred up by a Romish priest than a non-conformist." Raven, *John Ray, Naturalist,* p. 483. In any event, the arrangement was not a happy one from the children's point of view and it seems likely that Child was motivated primarily

Ray may also have felt morally bound to edit Willughby's natural histories for publication.[42] In any event, Ray remained at Middleton for several years, occupied at least in part with preparing the Latin edition of *The Ornithology of Francis Willughby*, printed by the Royal Society in 1676 and later translated and printed in an English edition (1678), with the Willughby family bearing the cost of engraving plates for the illustrations.[43] Ray's 'Preface' celebrates Willughby's reputation for learning and piety, but especially his gentlemanly qualities of honour and goodness. There is little doubt that the large illustrated volume, the first lavish production of a natural history work since the pre-civil war herbals of Parkinson and Gerard, was intended for a gentlemanly audience of *virtuosi* who could appreciate Willughby's character of civility and erudition.

In 1673, Ray embarked on the second time-honoured method for the

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by financial gain. Cassandra, Francis's daughter and later Duchess of Chandos, reported the 'unreasonable' demands made by Child "so that upon the whole my brother reckoned that Sir J. Child had sixty thousand pounds of out his estate." Even prior to his marriage to Emma (and when Ray was still legally responsible), Cassandra reports that Child demanded £500 per year from the estate for the children's board "when such little children as to be sure were very little expense to him, the youngest being but 9 weeks old when my father dyed;" Cassandra Willughby, *The Continuation*, p. 136. Ray's letter to Martin Lister dated 24 January 1676 makes the comment that Child was "sordidly covetous," *Further Correspondence*, p. 136.

[41] Letter to Timothy Burrell, July 22, 1990, facsimile reproduced in R. T. Gunther, *Early Science in Cambridge*, p. 351. The pension was subsequently increased to £72 per year.

[42] It also appears that the publication of Willughby's *Historia Piscium* was being considered at the same time, however financial support for the project was not forthcoming after the death of Willughby's mother's and his wife's remarriage; see the abstracts of letters dated 24 January 1676 and 12 November 1677, *Further Correspondence*, p. 136.

[43] Ray, *Further Correspondence*, p. 38.

improvement of social station in the seventeenth century; he married a member of the Willughby household. Margaret was the daughter of William Oakeley, from the staunch royalist Oakeley family of Shropshire and Oxfordshire. Margaret's father William was a member of the Oxfordshire gentry, who held tenure of the Manor House at Launton, Oxfordshire and had been appointed Justice of the Peace in 1664.[44] The visit of the "famous naturalist John Ray" at the Launton manor is recorded: "In 1672 Mr. Ray having lost some of his best friends, and, being in a manner left resolved to console himself with female society, in 1673 married a young lady not half his age, being only 20 years of age, the daughter of William Oakeley of Launton, Oxfordshire."[45] The couple resided at Middleton until 1675, and briefly at Coleshill near the Middleton estate, until 1677 when Ray became a client of Edward Bullock at Faulkborne, near Black Notley. Ray and his wife remained at Faulkborne until the death of Ray's mother when they again changed residence, this time to settle at Dewlands, the home Ray had built for his mother at Black Notley. The couple remained at Dewlands from June 1679,[46] raised a family of four daughters and by his own account enjoyed "tolerable enough not to say easy" prosperity. In 1691, Ray began to use the armorial seal of the Oakeley family on his correspondence, a final declaration of his position in gentle society.[47]

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[44] *Calendar of the Committee for Compounding*, 2 March 1646, "Robert Oakeley Compounded for delinquency in sending out a warrant for raising a dragoon in Co. Salop, 22 July. Fine. 460£."

[45] Edward Francis Oakeley, *The Oakeley Pedigree* (London: Privately printed by Mitchell, Hughes and Clark, 1934), p. 118. Raven seems to be mistaken when he claims Margaret was a daughter of "John Oakeley, of the parish of Launton in Oxfordshire, Gent."; Raven, *John Ray, Naturalist*, p. 176.

[46] Raven, *John Ray, Naturalist*, pp. 178-180.

[47] *Further Correspondence*, Editor's note, p. 169.

Inventing Natural History - Constructing the Community

Social and economic circumstances were especially important for authorial legitimacy. Indeed, in the seventeenth century, recognizing the creditworthiness of knowledge makers largely depended on a moral economy of trust and gentlemanly conventions.[48] As we have seen for the period 1662-1680, Ray had been occupied in the process of securing the proper social credentials which would ultimately enable him to become a legitimate spokesperson for matters of natural history. The presence of a spokesman however, presupposes a community in which the deployment of appropriate social strategies could operate. Further, it also presupposes a community in which the specific knowledge claims being advanced by Ray had meaning and significance. Certainly, historians of science have recognized the importance of the Royal Society during this period for the promotion of inquiries into nature and especially its crucial role for the establishment of matters of fact, the development of methodological protocols, and the deployment of literary technologies.[49] In the formative years of Ray's natural history projects, the Royal Society played a major role in printing important texts on natural history, including Ray's *Catalogus Angliae* (London 1670 and 1677), the *Catalogus Stirpium* (London 1673), and both the English and Latin versions of Willughby's *Ornithology* (1676 and 1678). However, when we consider the community which had been involved in Ray's early natural history endeavours, only a few individuals were fellows.[50] Within this young network, only Willughby, Skippon, Courthope and Lister, in addition to Ray himself, became Fellows of the Royal Society. By 1672 Willughby was dead, Courthope and Skippon were inactive in the Society, and Ray participated only occasionally in its affairs. Therefore we cannot take for granted a defined group of practitioners, either at the Royal Society or elsewhere, who were committed to a specific practice of natural history. Nor can we assume an identifiable readership to whom the matters of natural history would be of concern. In other words, during the period 1662-1680, there was no preexisting 'disciplinary matrix', to borrow Kuhn's term for group commitment.[51] In addition to constructing a respectable social identity, then, Ray would also cultivate and maintain a community of specialists with similar beliefs and values about the utility of natural history and who would contribute to his enterprise as well as provide an audience for his knowledge claims.

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[48] Shapin, 'A Social History of Truth-telling: Knowledge, Social Practice and the Credibility of Gentlemen', *A Social History of Truth*, pp. 65-125.

[49] See especially Shapin and Schaffer, *Leviathan and the Air Pump.*

In preparing the *Catalogus Plantarum circa Cantabrigiam* (1660), Ray had relied primarily on the experiences of his small circle at Cambridge University and the 'respectable' English authorities, John Parkinson and Thomas Johnson, the latter carefully identified by Ray as Doctor Johnson to recognize the medical degree bestowed by Charles I at Oxford in 1642.[52] With publication of the first edition of the *Catalogus Plantarum Angliae* in 1670, an alphabetical catalogue of plants found growing throughout England,

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[50] In addition to Willughby, Skippon, Courthope and Ray, Martin Lister, Walter Needham and Thomas Allen were Fellows of the Society.

[51] Thomas Kuhn, *The Structure of Scientific Revolutions*, 2nd edn (Chicago: University of Chicago Press, 1970), p. 182.

[52] See Chapter 2 for a discussion of the royalist and Anglican character of this natural history tradition.

Ray continued to acknowledge these sources as well as individuals who had belonged to Johnson's or Parkinson's networks. In addition, Ray recognized Restoration-era English authors on natural history or natural philosophy; he cited, for instance, works by Robert Morison, the 'King's Botanographer' and Professor at Oxford, [53] Christopher Merrett FRS and author of the *Pinax Rerum Naturalium* (1666, 1667),[54] as well as Robert Boyle and Thomas Sydenham.[55] The new *Catalogus* included an Appendix by George Bowles (Leyden 1640), the royalist physician thanked by Thomas Johnson in the preface to his emendation of Gerard's *Herbal* (1633). Notably, Ray also cited a friend of both Parkinson and Johnson, John Goodyer (1592-1664), who had begun a correspondence with Ray after the publication of the *Catalogus Cantabrigiam.*[56] However, the *Catalogus Angliae* reveals more than the recognition of contemporary authorities, and for the first time, the outline of a community of natural historians is apparent in Ray's pattern of acknowledgements in the work.

One of the challenges to the seventeenth-century natural history enterprise was the enormity of the undertaking. A complete history of nature was seen to be beyond the capabilities of any one individual, however conscientious and industrious. Thus, the construction of a community is especially important for projects of natural history where the collection and description of all the creations of nature was involved. John Wilkins enunciated a common understanding of the problem,

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[53] Ray, *Catalogus Angliae,* p. 24.

[54] *Ibid.*, pp. 66, 228, 316. Christopher Merrett, FRS was curator of the Harveian Museum for the London College of Physicians, and the author of the *Pinax Rerum Naturalium Britanicarum* (London 1666 and 1667), an alphabetical catalogue of plants, birds, fish, insects, serpents, and *ex animalibus*.

[55] *Ibid.*, pp. 3, 233, 238, 247, 326.

[56] John Ray, *Catalogum Addenda and Emendanda* (Cambridge, 1663), sv *Chamadrys Spuria Folis* "This Plant (as I am informed from Mr .Goodyer) is figured and described by Fabius Columna p. 288 under the title of Alysson Montanum"; Ray, *Catalogus Angliae,* pp. 325-341; Thomas Johnson,'Preface', *The Herbal of John Gerard* (London 1533), "Mr. George Bowles of Chislehurst in Kent must not be here forgot, for by his travels and industry I have had knowledge of diverse plants, which were not thought formerly to grow wild in this kingdom"; Alan Everitt, *The Community of Kent and the Great Rebellion 1640-1660* (Leicester: Leicester University Press, 1996), p. 118.

> Upon which account I may be excused for being so solicitous about the assistance of others in these matters, because of their great difficulty and importance. The compleating of such a design [to enumerate all kinds of things, notions and words], being rather the work of a College and an Age, than of any single Person: I mean, the combined Studies of many Students, amongst whom the several shares of such a Work should be distributed; and that for so long a course of time.[57]

In the *Catalogus Cantabrigiam,* Ray had specifically identified those whom he considered to be the most suitable candidates to be involved in the production of natural historical knowledge. In particular, Ray saw this work as most appropriate for well-educated gentlemen, and he made an appeal

> to men of University standing to whom God has given leisure and a suitable education and intelligence [to] spare a brief interval from other pursuits, and, without in any way neglecting their other studies, that they should develop the habit of examining Nature, and compile a comprehensive account of its creatures so that they can begin to gain wisdom by their own experience rather than from somebody else's brain, and learn to read the leaves of plants and interpret the characters impressed on flowers and seeds.[58]

Thus, when Ray began to work on the more comprehensive catalogue of plants throughout England, he began to recruit men of 'given leisure and a suitable education' to assist in his venture. In the *Catalogus Angliae*, the majority of citations were ascribed to professional physicians, the traditional 'experts' on *res herbaria*, but gentlemen and clergy also contributed to the project. Only two citations were for individuals whose 'business' was the study of plants: Jacob Bobart the Curator of the Oxford Physic Garden,[59] and Thomas Willisel who had been employed by Christopher Merrett and Robert Morison, and from March 1668 was also a collector for the Royal Society. Ray commented that Willisel was "a person employed by the Royal Society in search of natural rarities, both animals, plants and minerals; the fittest man for such a purpose that I know in England, both for his skill and industry."[60]

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[57] John Wilkins, Epistle Dedicatory, *An Essay Towards a Real Character and a Philosophical Language* (London, 1668).

[58] Ray, 'Preface to the reader', *Ray's Flora of Cambridgshire*, p. 26.

Ray continued to acknowledge contributions to his projects by "our Honoured Friend" Thomas Browne of Norwich, well known to Ray as the father of Edward Brown from Trinity College Cambridge. Edward himself had become a Fellow of the Royal Society in 1668 and would later become physician to Charles II as well as President of the Royal College of Physicians.[61] Ray also recruited several other medical professionals who would be acknowledged as contributing to the natural history enterprise in the forthcoming years. Among those so identified were Walter Needham FRS (1671), physician to the Charterhouse and author of *Disquitio anatomica de formato foetu* (London 1667) dedicated to Robert Boyle. Needham had also been at Trinity College

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[59] *Ibid.*, pp. 122, 131. Bobart was the son of the first Curator of the Oxford Physic Garden by the same name, and appears to have lectured at the University after Morison's death but without an academic appointment. *DNB*, vol. 2, p. 148, James Britten and George S. Boulger, 1931. *A Biographical Index of Deceased British and Irish Botanists*, rev. and completed A. B. Rendell, 2nd edn (London: Taylor and Frances 1931), p. 37; Joseph Ewan and Nesta Ewan, *John Banister and his natural history of Virginia 1678-1692* (Urbana, Chicago, London: University of Illinois Press, 1970), pp. 9-10; Sydney Howard Vines and G. Claridge Druce, *An account of the Morisonian Herbarium in the possession of the University of Oxford together with Biographical and Critical Sketches of Morison and the two Bobarts and their Works and the Early History of the Physic Garden 1619-1720* (Oxford: Clarendon Press, 1914), pp. lii - lxv.

[60] Ray, *Catalugus Angliae*, pp. 3, 4, 7, 15, 50, and so on, esp. p. 334.

[61] Ray, *Catalogus Angliae*, pp. 7, 67, 126, 313; Ray, *Willughby's Ornithology*, pp. 306, 311; William Munk, *Roll of the Royal College of Physicians*, Vol. 1 (London: The College, 1878), p. 372; *DNB*, vol. 3, pp. 4243.

Cambridge from June 1650 to 1654 and part of Ray's circle there; in the *Catalogus Angliae* Ray boasts Needham was a friend of long standing.[62] Edward Hulse who, like Ray, had left Cambridge in 1662 without subscribing to the Act of Uniformity, by 1670 had been incorporated MD at Oxford and was physician at the court of William of Orange. Hulse would also become active in the Royal College of Physicians in London and a frequent contributor to Ray's works.[63] An especially important friend of this period was Ray's European companion Martin Lister, who became one of Ray's most faithful supporters over the next forty years. Lister was exceptionally well connected: he was the son of Sir Martin Lister MP and Susanna, once a maid of honour to Anne of Denmark; his uncle Matthew, who had financed Lister's Cambridge education, was the 'celebrated' physician to Charles I. Lister would also be elected to the Royal Society, and participated in Robert Plot's Oxford Philosophical Society, as well as becoming a prolific writer on matters of natural history and medicine. Finally in 1703, Lister became physician to Queen Anne.[64] Ray acknowledged several observations supplied by *Generosus Vir. D.*

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[62] Ray, *Catalogus Angliae* (1670), p. 2; "*veteri amicita (de qua jure glorior) mihi conjunctissimus*"; *DNB*, vol. 14, pp. 154-165; W. W. Rouse Ball and J.A. Venn, *Admissions to Trinity College Cambridge*, Vol. 2 (London: Macmillan, 1911-16), p. 413; Venn and Venn, *Alumni Cantabrigiensis*, Vol. 3, Part I, p. 239.

[63] Ray, *Catalogus Angliae* (1670), pp. 3, 11, 75, 95, etc.; John Ray, *Historia* Plantarum, Vol. 1 (London, 1686) pp. 208, 801, 805, 810; *Historia Plantarum*, vol. 2 (London, 1688) pp. 1989, 1889, 1895, 1916, and so on; Munk, *Roll of the Royal College of Physicians*, Vol. 1, p. 397.

[64] Ray, *Catalogus Angliae* pp. 4, 8-9, 123, etc.; *DNB*, Vol. 11, pp. 1220-1230; Britten and Boulger, *Biographical Index*, p. 190; *Martin Lister's English Spiders 1678*, eds. and trans. John Parker and Basil Harley (Colchester: Harley Books, 1992); Robert Davies, 'A Memoir of Martin Lister', *Yorkshire Archaeological and Topographical Journal* 6 (1873), pp. 297-320; Munk *Roll of the Royal College of Physicians*, vol. 1, p. 442. Lister's own publications included: *Historia Animalium Angliae Tres Tractatus* (Three Tracts on English Animal History) (London, 1678); *Johannes Godartius of Insects* (York, 1682); *Historiae Sive Synopsis Methodicae Conchliorum* (London, 1685-1692); *A Journey to Paris in the Year 1698* (London, 1698); *Appendix* to Ray, *Historia Insectorum*, *De Scarabaeis Britannicis* (London, 1710).

Percivallus Willoughby MD, Francis Willughby's uncle with whom he became acquainted in Rome, and who has also been described as an "intimate friend of Harvey and most of the scientific men of the century."[65] Finally, Ray also cited George Horsnell, possibly a cousin of Philip Skippon; in the *Historia Plantarum,* Ray described Horsnell as a "Chirgion in London."[66]

While physicians and other medical experts had traditionally held a near monopoly on the detailed knowledge of plants and their properties, the *Catalogus* illustrates the emergence of another group of individuals concerned with botanical matters who were far removed from the healing professions. Thus, in addition to Willughby and Skippon, Ray identified several gentlemen who shared a similar concern with precise and circumstantial information about nature and were willing to invest time and energy in the pursuit. Barnham Soames of Little Thurlow, Suffolk, brother to William Soames, FRS, joined Ray's emerging network of botanical enthusiasts. Barnham, who had also met Ray in Rome and travelled with him to Tivoli, would become closely associated with Ray's natural history ventures, and an important contributor to the *Historia Plantarum* (1686 and 1688).[67] The Sheffield brothers, Samuel and John Fisher, both alumni of Trinity College, were also recruited by Ray, and became correspondents and contributors to seventeenth-century natural history.[68] In 1671, a companion on many of Ray's British botanizing trips, Thomas Willisel, introduced Ray to Ralph Johnson, one of the many English divines who would come to participate in Ray's version of natural history. Johnson, the Vicar of Brignall in Yorkshire, became a significant member of Ray's network of the 1670s, and is remembered as one of the most consistent contributors to Ray's projects in natural history. Johnson's efforts in zoology, ichthyology and botany were acknowledged in virtually all of Ray's later works.[69]

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[65] Munk, *Roll of the Royal College of Physicians,* Vol. 1, p. 231

[66] Ray, *Catalogus Angliae,* pp. 56, 248, Ray, *Historia Plantarum,* Vol. I, p. 988; John Ray, *Synopsis Methodica Stirpium Britannicarum* (London, 1690), p. 96. Raven, *John Ray, Naturalist,* p. 144.

[67] Ray, *Historia Plantarum*, sig. A3, pp. 158, 161, 174, 235, 294, 303, and so on.; Venn and Venn, *Alumni Cantabrigiensis,* Vol. 4, Part I, pp. 119-120.

Ray's concern with natural history was not exclusively devoted to the identification and description of plants. During this period he is also remembered for efforts to edit and publish *The Ornithology of Francis Willughby.* Many who participated in Ray's botanical projects joined in this venture as well, including Martin Lister, Philip Skippon, Thomas Brown, Francis Jessop and Ralph Johnson.[70] Other individuals who provided ornithological observations included "my worthy friend," Thomas Allen (d. 1684), FRS (1668), FRCP (1671), physician to the Bethlehem Hospital and who attended Cambridge as a student at Trinity (1648-1651) and Fellow at Caius (1651-60).[71] Several gentlemen cited solely in Willughby's *Ornithology* had also been part of the Cambridge community: For instance Ray mentioned: Sir William Foster of Bamberg [Bamborough?], Northumberland, who had attended Christ's during the 1650s;[72] Dr. Thomas Hewley of Yorkshire, had been at Sidney Sussex;[73] Mr. Skrimshew of Norbury in Staffordshire may identify either John or Gerard, both of whom had been at Trinity and lived at Norbury in Staffordshire during Ray's preparation of the *Ornithology*;[74] and finally John Copes "a Citizen of London now living in Jewin Street," formerly of St. Catharine's College.[75] That these individuals had all shared the experience of attending Cambridge, suggests Ray's university associations may have provided introductions to the homes of individuals who otherwise took little part in the overall project.

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[68] John Fisher was at Trinity 1649-1653, Samuel attended 1650-1654; both resided at Sheffield during the 1660s and 1670s. Ray, *Catalogus Angliae* p. 326; Ray, *Observations*, p. 202; Rouse Ball and Venn, *Trinity College Admissions*, p. 412; Venn and Venn, *Alumni Cantabrigiensis*, Vol. 2, Part 1, p. 143.

[69] Ray, *Catalogus Angliae*, 2nd edn (London, 1676), pp. 219, 304; Frank Horsman, 'Ralph Johnson's notebook', *Archives of Natural History* 22(2) (1995), pp. 147-167.

[70] John Ray, 'Preface', *The Ornithology of Francis Willughby of Middleton in the County of Warwick, Esq. Fellow of the Royal Society* (London 1676, 1678), sig. (A), (a2).

[71] Ray, *Ornithology*, p. 266, Hunter, *Morphology*, pp. 182-183 (F253); Munk, *Roll of the Royal College of Physicians*, Vol. 1, p. 361; Venn and Venn, *Alumni Cantabrigiensis*, Vol. 1, Part 1, p. 19.

An additional, if largely neglected, aspect of Ray's natural historical studies appears in the several volumes devoted to the study of words and language. These works included The *Collection of English Proverbs* (Cambridge 1670 and 1678; dedicated to Peter Courthope); *A Collection of Unusual English Words not generally used* (London 1674 and 1691) which was a vocabulary of British dialectical words; and, the *Dictionariolum Trilingue* (London, 1675) an English/Latin/Greek glossary, and Ray's most frequently reprinted text after the *Wisdom of God*.[76] There had been a traditional relationship between the knowledge of nature and the categories and vocabulary of

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[72] Ray, *Ornithology*, pp. 335, 360, 362; Venn and Venn, *Alumni Cantabrigiensis*, Vol. 1, Part 1, p. 164.

[73] Ray, *Ornithology*, p. 342; Venn and Venn, *Alumni Cantabrigiensis*, Vol. 1, Part 1, p. 362.

[74] Ray, *Ornithology*, p. 347, Venn and Venn, *Alumni Cantabrigiensis*, Vol 4, Part 1, p. 34, listed as "Scrymshere". John was at Trinity 1636-38 and Gerard 1635-39.

[75] Ray, *Ornithology*, p. 181; Venn and Venn, *Alumni Cantabrigiensis*, Vol 1, Part 1, p. 393.

[76] Geoffrey Keynes, *John Ray, A Bibliography* (London: Faber and Faber, 1951), p. 44.

Aristotle through the Middle Ages and Renaissance, and this association persisted throughout the seventeenth century.[77] For instance, John Wilkins, a founding member of the Royal Society, epitomized the attitude that language and natural philosophy were not distinct disciplines but represented a common enterprise. Wilkins, in the *Essay Towards a Real Character and A Philosophical Language* justified his language project precisely for its utility to "promote and facilitate the knowledge of nature."[78] Further, in the seventeenth century, many of the problems associated with natural history continued to be concerned with the interpretation, translation or analysis of texts. Therefore, in addition to the practical knowledge of nature itself, naturalists often required the *scientia* and skills of philology.[79] Ray himself reflected this dual character of natural history in his first work in botany, the *Catalogus Plantarum circa Cantabrigiam* (1660). He incorporated a nomenclature for each plant in accordance with the accepted practice of listing other names by which a plant had been known in authoritative texts. However, Ray also included a forty-seven-page *Etymologia* on the origin of words and names from the Greek, Latin or Hebrew, and a Latin vocabulary of the technical terms that he used for plant descriptions.[80] Ray would continue to refine the philological dimension of natural history as it pertained to plants, even throughout his most important work, the *Historia Plantarum* (1686, 1688 and 1704).

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[77] See especially James J. Bono, *The Word of God and the Languages of Man: Interpreting Nature in Early Modern Science and Medicine, Vol. 1 Ficino to Descartes* (Madison: The University of Wisconsin Press, 1995), pp. 123-212; Mary E. Slaughter, *Universal Languages and Scientific Taxonomy in the Seventeenth Century* (Cambridge: Cambridge University Press, 1983).

[78] Wilkins, *An Essay Towards a Real Character*, sig. a *v*.

[79] Vivian Nutton, 'Greek Science in the sixteenth-century Renaissance', *Renaissance and Revolution: Humanists, scholars, craftsmen and natural philosophers in early modern Europe*, eds. J. V. Field and Frank A.J. L. James (Cambridge: Cambridge University Press, 1993), pp. 15-28, see esp. pp. 24-25; Karen Meier Reeds, *Botany in Medieval and Renaissance Universities*, Harvard Dissertations in the History of Science, ed. Owen Gingerich (New York and London: Garland Publishing, 1991), pp. 93-133.

These texts share with Ray's more commonly received natural history works a commitment to exhaustive collection of empirical data, comparative textual research and a dedication to accurate reportage;[81] in fact, the field work involved to research the book of proverbs and the vocabulary appears to have been undertaken during Ray's botanical excursions throughout England. In the *Dictionariolum*, originally intended as a text for Willughby's sons, Ray claimed to be prompted to publish the work "having lately had occasion to review some of the last Published English and Latin Nomenclatures, I observed in them some inveterate Errors, especially in the names of Animals and Plants."[82]

These undertakings also shared another important characteristic with Ray's natural history projects; a roster of individuals who committed part of their intellectual energies to a particular study of nature. This selection of clergy and gentlemen shared many of the attributes of Ray's more commonly constituted natural history network, and in fact several individuals also provided Ray with plant or animal observations, again confirming that the study of language and the study of nature were seen by contemporaries as an integrated activity. Among those who contributed to Ray's philological projects was Francis Jessop, Esq. of Broomhall, Sheffield, one of the executors of Willughby's estate and a friend of Samuel and John Fisher as well as Martin Lister. [83] Jessop, a contemporary of Ray and Willughby's at Trinity College,[84] was a typical seventeenth-century *virtuoso;* he sent Ray information on insects, contributed toward Willughby's *Ornithology,* occasionally published in the *Philosophical Transactions*, and was also the author of a mathematical treatise *Propositiones Hydrostaticae ad illustrandum Aristarchii Samii destinatae & quadum Phoenomena natura generalis* (London 1687) published by the Royal Society printers.[85] In the collection of proverbs, Ray also thanked "Mr. Newton of Leicester"; James Newton (1639-1718) botanized with Ray during the late 1670s and was a regular contributor to his subsequent natural histories. In fact, the 1688 *Fasiculus Stirpium Britanicarum* was written by John Ray and friends, including James Newton.[86] 'Michael Biddulph, Gent.' of Polesworth, Warwickshire, who had been at St. Catharine's in 1644/5 when Ray attended, also contributed Proverbs for the collection.[87]

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[80] Susan McMahon, *Natural Histories or Histories of Nature* (MA Thesis, University of Calgary, 1994), pp. 95-103.

[81] David Cram, 'John Ray and Francis Willughby. Universal language Schemes and the Foundations of Linguistic Field Research', *Understanding the Historiography of Linguistics. Problems and Projects*, ed. W. Mullen (Munster: Modus, 1990), pp. 229-239.

[82] John Ray, ' Preface' *Dictionariolum trilingue secundum locos communes, nominibus usitatioribus Anglicicis, Latinis, Graecis* (London, 1675).

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[83] Hunter, *Morphology of the Royal Society*, p. 10; Mary Welch, 'Francis Willughby, FRS (1635-1672)', *Journal of the Society for the Bibliography of Natural History* 6(2) (1972), pp. 71-85; Raven, *John Ray, Naturalist*, pp. 35, 137, 148, 447.

[84] Venn and Venn, *Alumni Cantabrigiensis*, Vol 2, Part 1, p. 475; Rouse Ball and Venn, *Trinity College Admissions*, p. 341.

[85] Ray, 'Preface' *Ornithology*, sig. (a); John Ray, *A Collection of English Proverb*, sig. Av; Ray, *Correspondence*, pp. 33, 67, 70; *Philosophical Transactions*, No. 68 pp. 2063-6, February 1671; *Philosophical Transactions*, no. 119, pp. 450-51, November 1675,

[86] Ray, *A Collection of English Proverbs* sig. a2; Ray, *Correspondence*, p. 139, Ray, *Synopsis*, pp. 119, 196; Ray *ab amicis*, *Fasciculus stirpium Britannicarum post editum plantarum Angliae catalogum observatarum* (London, 1688). James Newton also communicated with the botanists Leonard Plukenet and Paul Hermann. Raven and others identify Newton as Dr. James Newton, (d. 1750), keeper and physician to a private madhouse near Islington turnpike, however this appears to be a misidentification, Britten and Boulger, *Biographical Index*, pp. 228; *DNB*, vol. 14, pp. 393-394; Raven, *John Ray Naturalist*, p. 218.

Clergy were more frequent contributors to Ray's philological projects than were gentlemen. Clergymen included George Antrobus, who had received his MA from Jesus College Cambridge (1660), was Master of the Grammar School at Tamworth, Warwickshire (1659-1708) near Willughby's Middleton estate and Rector of Wollaton (1679-1708). Antrobus officiated at the marriage of Ray and Margaret Oakeley, but is perhaps better known as the father-in-law of the natural philosopher William Whiston. Antrobus also submitted a series of questions on the splitting of trees to the Royal Society.[88] Another schoolmaster at Tamworth, Walter Ashmore, contributed proverbs to Ray's second edition, and was acknowledged as a contributor to Ray's botanical works.[89] Ray also received proverbs from Robert Sherringham of Caius College in Cambridge, who had been ejected from Caius College Cambridge during the civil wars and restored in 1660. Sherringham was also the author of *The Kings Supremacy asserted or a Remonstrance of the Kings Right against the Pretended Parliament* (London 1660 first edition, 1682 third edition).[90] Ray's neighbour in Essex, "my worthy friend" Richard

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[87] Ray, *Collection of English Proverbs*, sig. A2v; Venn and Venn, *Alumni Cantabrigiensis*, Vol. 1, part 1, p. 149.

[88] Ray, *Collection of English Proverbs* sig. A2v; Birch, *History of the Royal Society*, vol. 4, pp. 279-280; Venn and Venn, *Alumni Cantabrigiensis*, Vol. 1, part I, p. 24; *Thoronton Society Record Series* XV Part III (1954), p. 51.

[89] Ray, *Collection of English Proverbs*, sig. A2v; Ray, *Historia Plantarum*, Vol. II, p. 1851; Vol. III, p. 20.

[90] Ray, *Collection of English Proverbs*, sig. A2v; A. G. Matthews, *Walker Revised: being a revision of John Walker's Sufferings of the Clergy during the Great Rebellion 1642-60* (Oxford: Clarendon Press, 1948, rpt. 1988), p. 37.

Kidder, provided the entire collection of Hebrew proverbs for the volume. Kidder had been at Emmanuel College Cambridge 1649-1656; like Ray he had chosen not subscribe to the Oath of Uniformity and was ejected from his living at Stanground, Huntingdonshire. In 1664, after subscribing to the Oath, he was appointed Rector of Rayne near Braintree, and later became Bishop of Bath and Wells (1691-1703), chaplain to William and Mary, and the second Boyle lecturer (1693).[91] In the *Collection of Unusual Words,* Ray provided a special mention for "my worthy friend Mr. Francis Brokesby, sometimes Fellow of Trinity College in Cambridge, and since Rector of Rowley, Yorkshire" (1668-1682). Brokesby was another alumnus of Cambridge, and friends with the 'famous Oxford antiquary' Thomas Herne and Henry Dodwell, Camden Professor of History of Oxford.[92] Finally, Andrew Paschall, Rector of Chedsey in Somersetshire became involved with John Aubrey and others in a project to further develop Wilkins' works on universal language. Paschall, who had been a fellow at Queen's College Cambridge from 1653-1663, also received thanks from Ray for contributing proverbs to the book; Paschall would reciprocate, referring to "my learned and worthy friend Mr. John Ray."[93]

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[91] Ray, *Proverbs,* sig. A2; *DNB,* Vol. 11, pp. 96-98; Venn and Venn, *Alumni Cantabrigiensis,* Vol. 3, Part I, p. 13; Kidder, 'Autobiography", *Lives of the Bishops of Bath and Wells*, ed. S. H. Cassan (London, 1829-30), pp. 227-233.

[92] Ray, *Collection of Unusual Words,* (London 1691), sig. A5; Ray, *Collection of English Proverbs,* sig. A2v; Venn and Venn, *Alumni Cantabrigiensis,* Vol. 1, part 1, p 279; *DNB,* vol. 2, pp. 1299-1300; Rouse Ball and Venn, *Trinity College Admissions,* p. 421; Francis Brokesby, *The Life of Henry Dodwell* (London 1715); Brokesby, *A History of the Government of the Primitive Church* (London, 1712); Brokesby, *A Letter to Mr. Hearne, containing an account of some Asservations relating to the Antiquities and Natural History of England* (Oxford, 1711).

[93] Ray, *Collection of English Proverbs,* sig. A2; Andrew Paschall to Dr. Ralph Bathurst, President of Trinity College Oxford, 28 May 1694, *Further Correspondence,* p. 184; A. J. Turner, 'Andrew Paschall's Tables of Plants for the Universal Language, 1678', *Bodleian Library Records* 8 (1978), pp. 346-350.

My research shows that during the period 1662-1682, Ray's network included twenty-seven individuals who were either acknowledged by Ray to be a friend and contributor, or who consistently participated in Ray's natural history ventures and received particular commendation throughout the texts. Physicians were the largest single group of individuals to take part in Ray's projects, and they were especially active in contributing to the works on plants. The representation of physicians in Ray's network perhaps is to be expected in a profession which had traditionally required extensive knowledge of *materia medica.* The presence of a significant number of gentlemen may also be explained, at least in part, by the 'culture of collecting' which prevailed during the period, especially for wealthy gentlemen of leisure and education. Note that there were no aristocrats or gentlemen of 'the first rank' among Ray's community; although Willughby may have had (or aspired to) entrance into these ranks, Ray's social standing would have precluded their inclusion without Willughby's continued patronage.

It is more challenging to account for the number of clergymen who were active within Ray's natural history community. It is not enough to suggest that the study of nature was seen as a 'religious duty' in the seventeenth century;[94] if this were the case we should expect to find a comparatively large number of divines involved in such projects prior to Ray's efforts. However, my own research identifies only one or two clergymen active in the distinct natural history tradition before 1660.[95] Nor is it sufficient to point to the existence of clergy who were elected Fellows of the Royal Society during this period, as the majority were inactive members of the Society.[96]

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[94] As for instance, Richard S. Westfall, *Science and Religion in Seventeenth Century England* (New Haven: Yale University Press, 1958).

[95] This is not to suggest that clergymen were not active in other contemporary intellectual pursuits, such as antiquarian studies, but that very few engaged in the early natural history tradition to which Ray appealed.

A more relevant common identifier among the members of Ray's community than profession or social standing is university experience. Twenty-one individuals have been identified as attending university, while only two (Willisel and Bobart) certainly were not university students; the university affiliation of Newton and Ashmore, if any is unknown. We may expect that, by virtue of exposure to studies at the university level, graduates would share a similar although by no means identical approach to natural philosophy. Natural philosophy continued to form a core part of the university curricula in the seventeenth century and was understood by contemporaries as the means by which an individual approached the knowledge of God through knowledge of God's creation.[97] Especially striking however, is the shared experience of the majority of individuals (17) who attended Cambridge prior to the Restoration of Charles II in 1660. While six individuals attended Trinity during the 1650s, which has been characterized as increasingly Royalist during these years,[98] there is insufficient data to make similar claims regarding other colleges. However, by the 1670s there is no question of the loyalty any of the members of Ray's network, even taking into consideration the political instability arising from the exclusion crises and later the Monmouth uprising. Given the example of Sherringham, at least some overtly royalist sympathies existed. Among the individuals, including Ray himself, who chose not to subscribe to the Act of Uniformity in 1662, no evidence exists which indicates a continued nonconformity to the church.

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[96] According to those designated 'divine' in Michael Hunter's *The Royal Society and its Fellows*, of the 404 Fellows elected to the Royal Society by the end of 1682, only 40, or 10%, were clergymen. Hunter designates only 4 individuals (Wilkins, Ward, Holden and Gale) as active in the society (1%). Four individuals were correspondents or occasional correspondents (Beale, Cotton, and Glanvill as well as Boulliau, a french priest) (1%). Hunter designates two individuals as 'slightly active' or 'fairly active' (Milles and Mapletoft) (.5%). The remaining 30 divines are listed as inactive or barely active. This also suggests that most of the clergymen elected to the Royal Society were primarily to add religious legitimacy to the venture. Hunter designates Ray not as a clergyman, but as a 'naturalist'.

[97] John Gascoigne, 'A reappraisal of the role of theuniversities in the Scientific Revolution', *Reappraisals of the Scientific Revolution*, eds. David C. Lindberg and Ronald S. Westman (Cambridge: Cambridge University Press, 1990), pp. 207-260.

[98] Winn, *John Dryden and His World*, p. 70; see also Chapter 1.

More generally, it is possible to characterize Ray's network as a group of individuals who shared similar education, experiences and culture. It is also possible to claim that the majority, if not all, shared values and beliefs which included an attachment to the Church of England and the crown of England. By virtue of their education or their birth, all members of Ray's network may be located within a 'civil society' with the leisure and means to pursue their own interests. The status of natural history as a respectable and legitimate pastime for Anglican gentlemen which had been a noteworthy feature of Royalist seclusion during the Interregnum,[99] became increasingly consolidated in the 1670s with the emergence of Ray's network. The network however, was not self-sustaining, but would involve a determined effort to maintain and cultivate.

CONCLUSION

In the seventeenth century, the status of a gentleman implied a set of social conventions which included specific protocols of behaviour and codes of values which were recognized and had meaning within a specific culture. To be identified as a gentleman was also seen as a powerful advertisement of an individual's trustworthiness, credibility and free agency. John Ray's ultimate leadership role in the discipline of natural history rested upon his reputation as a gentleman within the civil society of Restoration England. It was also the result of a determined and self-conscious effort to acquire the appropriate social credentials to speak on matters of natural history and natural philosophy. The European grand tour, the successful search for a patron and a socially advantageous marriage were various aspects of Ray's consistent strategy to refashion his identity from itinerant scholar to gentleman with social credit.

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[99] See Chapter 2.

Successful acquisition of gentlemanly status was also important for Ray's recruitment of a gentlemanly community of natural historians. Ray's personal network, the majority of whom were Cambridge University graduates, were representative of the 'values, aims and norms' of the Restoration Anglican community, and provided the basis of the community in which the practices and concepts of natural history became embedded.

TABLE I
NATURAL HISTORY NETWORK 1662-1678[100]

Profession	Number	Attended Cambridge	Attended Oxford	Unknown/ Attended other
Physicians.[101]	9	5	2	2
Clergymen/Academics[102]	8	6	1	1
Gentlemen[103]	8	6	-	2
Botanical 'Experts'[104]	2	-	-	2
Total	27	17	3	7

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[100] I have constituted Ray's network from his acknowledgements in the publications during the 1670s, and his published correspondence. Judgements were made concerning the constitution of the network. I have included those individuals identified by Ray as a 'friend', who were acknowledged by Ray as a contributor to at least one publication, or who corresponded directly with Ray. I have omitted individuals Ray chose not to identify as a friend or contributor, or who only supplied one observation. For instance Thomas Senior, ejected from Trinity in 1660 and a non-conformist, was originally cited in the *Cambridge Catalogue,* and his early observation continued to be acknowledged. However Senior did not have an ongoing correspondence with Ray and did not offer further identifications. Ray also identified a Mr. Witham who observed a plant "in Hazelwoods near Sir Walter Vavasour's Park in Yorkshire", and who may have been a contributor to Merrett's *Pinax (*pp. 1, 65, 74). Again, Witham does not seem to figure as part of Ray's ongoing network. There were also several observations of birds or animals which refer to the house or property of a specific individual, but whose owners do not appear to be personally associated with Ray's projects.

[101] Includes Thomas Brown, Martin Lister, Edward Hulse, Percival Willughby (Oxford 1620/21), Walter Needham, Thomas Cornelius of Naples, George Horsnell, Thomas Allen and Robert Thornton, a physician at Nottingham who had attended Christ's College, Cambridge 1639-1646, see Ray, *Cat. Angliae* (1677) p. 101.

[102] Ralph Johnson, Richard Kidder, Francis Brokesby, George Antrobus, Andrew Paschall, and Mr. Sherringham. I have assumed Mr. Brown, cited in Ray, *Cat. Angliae* (1677), p. 215, is William Brown (1629-1678) of Magdalen College Oxford and not Thomas Browne usually identified by Ray as Dr. Brown or Tho. Brown MD; William Brown was fully identified as *"D. Brown, STB Collegii Magdalensis, in Academia Oxoniensis Socio", Historia Plantarum*, vol. 2, pp. 1313. The university affiliation of Walter Ashmore, if any, is unknown.

[103] Gentlemen were Francis Willughby, Philip Skippon, John Fisher, Samuel Fisher, Francis Jessop, Barham Soames, Michael Biddulph and James Newton, I have not included Alexander Balam, (Ray, *Cat. Angliae* pp. 305-306 re: Trifolium Stellatum Glabrum. "Out of Africa it was brought by Alaxander Balam, Gent". Balam was a surgeon in Africa, whose'Catalogue of Plants growing within the Fortifications of Tangier' was published in the *Philosophical Transactions* (19), pp. 239-249.

[104] Thomas Willisell and Jacob Bobart. There is no evidence that Willisel attended university. Jacob Bobart who was Curator at the Oxford Physic Garden also appears not to have done so, although his brother Tilleman attended Oxford.

CHAPTER 7

Ordering the Community

> Then I felt a great desire to help the studies of others who might be filled with a love of *res plantae*, and I carefully considered how I could most effectively assist them, so that they, perhaps less patient of labour than myself, would not be deterred by the endless succession of difficulties.[1]

The shared understanding of a community of practitioners dedicated to a specific scholarly tradition and agreed upon common practices, values and techniques is especially important for the stabilization of a scientific culture. Such identifiable communities are not only the producers of new knowledge, but also function to validate the intellectual productions of its membership. It is the existence of a committed group of experts engaged in an array of defined communal activities which may be said to delineate a scientific discipline.[2] A recent account claims disciplinary status for the largely philological and often conflicting enterprise of sixteenth century Italian natural historians. This assertion, however, rests on the most generalized criteria uniting an otherwise deeply divided community to a collection of common texts.[3] Our more common understanding of the structure of a scientific discipline requires a clearly defined topic, agreement upon a set of procedures and, especially, an expert community where commitment to the communal enterprise is maintained and observed within the disciplinary matrix.[4] On these criteria, natural history in England emerged as a discipline only in the late seventeenth century, marked by the practice of the enterprise within a community dedicated to a particular disciplinary structure.

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[1] Ray, '*Praefatio ad Lectorem*', *Catalogus Cantabrigiam*, n.p. "*Ex hoc tempore invasit nos vehemens desiderium aliorum etiam studia promovendi, siqui pariter res plantariae amore tenerentur, ne laboris minus patientes fatiscerent longa difficultatum serie deterriti, quaque his ratione commodissime inservire possimus solicite consideramus.*"

[2] Thomas Kuhn, *The Structure of Scientific Revolutions*, 2nd edn (Chicago: University of Chicago Press, 1970), pp. 176-187. The sociological sense of Kuhn's paradigm incorporates the constellation of beliefs, values, techniques and so on, shared by members of a given community in their practice of 'normal science'.

[3] Paula Findlen, 'The Formation of a Scientific Community: Natural History in 16th century Italy', *Natural Particulars: Nature and the Disciplines in Renaissance Europe*, eds. Anthony Grafton and Nancy Sirasi (Cambridge MA and London: MIT Press, 1999), pp. 369-400.

During the Restoration, the young Royal Society had endorsed an array of natural historical activities which used a variety of methods and techniques. However, there was neither a single agreed-upon definition of natural history nor a uniform methodology. Indeed, the Royal Society had directly sponsored an important program of 'experimental' natural history which however, was not incorporated into the larger community of natural philosophers. During the Restoration, John Ray had been at the centre of an extensive correspondence network of natural historians, most of whom were not associated with the Royal Society. By 1682, the activity of natural history among Ray's network had stabilized as the precise and accurate analytical description of natural phenomena. As these natural historians became increasingly competent observers, they also became preoccupied with taxonomy, the natural philosophy of delineating the natural order and relations of things. Thus, Ray's natural history network is important for the role it served to perpetuate attitudes, practices and protocols as they were developing within that community during the last decades of the seventeenth century. Further, Ray himself was pivotal in promoting the specific mental and moral training required for inclusion within the community and in the subsequent maintenance of the communal structure.[5]

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[4] *OED sv* discipline: (1) Instruction imparted to disciples or scholars; a particular course of instruction to disciples; (3) Instruction having for its aim to focus the pupil to proper conduct and action; the training of scholars or subordinates to proper and orderly action by instructing them in the same; (5) The order maintained and observed among disciples.

Disciplining the Community

Proper instruction in the appropriate scholarly tradition is especially important in forging specialist communities. In the case of natural history, proper instruction included training individuals in the appropriate methods for reliable species identification, which consisted of a learned set of skills based on "rules founded upon mental experience yet unknown to the vulgar."[6] While the correct identification of birds, fish and mammals was an important aspect of early modern natural history, the most challenging projects involved plant species. Much of the natural historical literature of the sixteenth century is concerned with disagreements about the proper identification of individual plants, and this continued to be a contentious issue even among the 'experts' of the late seventeenth century: Ray frequently questioned the judgement and accuracy of other individuals, and in turn others dissented from some of Ray's designations.[7]

Proper identification of plants was a practical skill which was neither self evident nor amenable to a narrow set of instructions. It was a technique acquired through tradition, training and familiarity; this was the only way to produce precise, accurate and

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[5] H. M. Collins, *Changing Order: Replication and Induction in Scientific Practice* (Chicago and London: University of Chicago Press, 1992), pp. 128-157; Ludwik Fleck, *Genesis and Development of a Scientific Fact* (Chicago and London: University of Chicago Press, 1979), pp. 84-145.

[6] Martin Vogel to Henry Oldenburg, 9 April 1680, *Correspondence of Henry Oldenburg*, ed. A.R. Hall and M.B. Hall (Madison: University of Wisconsin Press, 1969), p. 619.

[7] See for instance the lengthy letter from Leonard Plukenet to Ray which enumerates many disagreements about 'proper' identifications; 3 June 1690, and from Tancred Robinson 12 July 1683; *Correspondence of John Ray*, pp. 133; 213-224.

'correct' observations.[8] Proper identification was tedious, time consuming and labour intensive; indeed contemporaries acknowledged that "the Knowledge of Plants is a confused thing depending wholly upon an uncommon Strength of Memory and Imagination, and even with the Help of the best Books scarce attainable without a Master."[9] "After a full six years from the time I gave my attention to this discipline," Ray's *Catalogus Cantabrigiam* (Cambridge, 1660) contained approximately 600 plants, a number comparable to the ancient Greek herbal of Dioscorides.[10] Caspar Bauhin's *Pinax Theatri Botanici* (Basel, 1623) had enumerated about 6000 plants with their nomenclature and descriptions, which was the culmination of 40 years of work.[11] Ray's *Historia Plantarum* (London, 1686-1704) would describe and classify 18000 plant species. This was a monumental undertaking; it drew upon the combined experience and expertise of a large community of natural historians.[12] However, these individuals, whatever their level of commitment to the overall natural history project of the seventeenth century, had also needed to develop sufficient skills to identify the attributes, and especially to distinguish the similarities and differences which were significant for specifying plant identities. In other words, in order to contribute to natural history and especially to the botanical projects of the period, individuals had to learn to become competent, accurate observers; further, such competency required experience as well as an array of learned perceptions which in themselves relied on attaining a set of social skills. The natural history community of Restoration England, no less than other scientific cultures, would need to learn ways of seeing and doing their activity that were community-specific and locally-relevant.[13]

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[8] See especially Collins' discussion of tacit knowledge transfer; *Changing Order*, pp. 51-78; and Fleck on disciplined perception, *Genesis and Development*, pp. 92-95

[9] William Wotton, *Reflections upon Ancient and Modern Learning* (London, 1694), p. 254. We should also remind ourselves that it would be fully a century in the future before the Linnaean method was promoted as simple enough so that "fair country-women and unlearned countrymen," or even children, could "amuse themselves with natural history;" Jean Jacques Rousseau, *Letters on the Elements of Botany. Addressed to a Lady. Translated into English with Notes and Twenty-Four Additional Letters, Fully Explaining the System of Linnaeus.* Trans. Thomas Martin, Professor of Botany in the University of Cambridge (London, 1785), sig. A3. Martin's translation of Rousseau's *Letters* (1771) subsequently went through at least eight editions by 1815 and was important in popularizing the Linnaean system in Great Britain.

[10] 'Preface to the Reader', *Ray's Flora of Cambridgeshire* , pp. 23-24; John Riddle, 'Botany at 100', XVI International Botanical Congress, St. Louis MO, 1-7 August, 1999.

[11] *Ray's Flora of Cambridgeshire*, p. 23.

[12] John Ray, *Historian Plantarum*, London, Vol. 1 1686; Vol. II 1688; Vol. III 1704.

In the *Catalogus Cantabrigiam*, Ray described the generally accepted and time-honoured 'right course and method' for studying plants. Appealing to the humanist tradition of 'learning botany from books' in concert with meticulous observations of the living plant, Ray claimed to have compared his personal experience with existing, authoritative botanical texts and illustrations.[14] "First of all," explained Ray, "I had to familiarize myself with the literature of the subject, and then compare the plants that I had found in the countryside with the pictures in the books; then when I found any similarity between them, I had to study the descriptions more closely. After a time I acquired skill from practice."[15]

The idealized method of learning from printed herbals was to compare the illustration of individual plants in one (but preferably more than one) 'authoritative' text with one's own observation of the living plant and then to compare both the illustration and personal observation with the authority's eyewitness description of the plant.[16] By careful scrutiny, the 'properly' trained eye was held to be able to detect the small but crucial differences between the various plants which correct identification required. By the seventeenth century, there was an array of resources to facilitate such studies: texts and their illustrations had become increasingly accurate in portraying precise and detailed plant images. A range of herbaria and gardens, especially those associated with university medical faculties, also cultivated many species where first hand knowledge of *materia medica* could be obtained. Despite these improvements, we should not underestimate the complexity of the task. If we accept Ray's method according to his own instructions, in order for him to identify approximately 600 plants in Cambridgeshire, he would have had to compare the descriptions of several thousands of plants from authorities whose illustrations may have been incomplete or obscure. To complicate matters, the illustrations and descriptions of plants were occasionally incorrectly matched and the written descriptions were often imprecise or ambiguous, a situation which also meant that reliable identifications were difficult. Because there was no standardized agreement on which attributes were to be used to specify the identity of plants, the use of different criteria often meant that forms of the same plant were encountered with different species names, a problem, Ray complained, which resulted in authors who "multiplied groups unnecessarily."[17] Even after Thomas Johnson's much-praised improvements to John

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[13] See especially Collins' discussion of tacit knowledge transfer; *Changing Order*, pp. 51-78; and Fleck on disciplined perception, *Genesis and Development*, pp. 92-95

[14] Karen Reeds, 'Renaissance Humanism and Botany', *Annals of Science* 33 (1976), pp. 519-542.

[15] *Ray's Flora of Cambridgeshire*, p. 23.

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[16] Reeds, 'Learning Botany from Books', *Botany in Medieval and Renaissance Universities*, pp. 135-165.

[17] *Ray's Flora of Cambridgeshire*, p. 35.

Gerard's *Herbal,* that volume still contained faults. According to Charles Raven, "the figures and descriptions by no means always agree; many species appear more than once; varieties are multiplied, and it is no easy task to identify plants from it."[18] Finally, existing plant nomenclature was highly complex, confusing and individualized as earlier botanists each assigned their own system of names, so that it could be difficult to know if two authors were writing about the same plant even when illustrations were supplied.

Special identification problems arose with plants not previously described in the literature. Early in his career, for instance, Ray tells us, "I found . . . a plant which the last year I observed . . . which puzzles me sore: it is between a grass and a caryophillus, I know not what to call it unless it be *Polygono angustissimo folio affinis,* C[aspar] B[auhin], but I cannot find that described anywhere . . . The seed vessel is large and perfectly to be seen: the flower is a very small yellowish one."[19] Given the enormous difficulties of a direct one-to-one comparison of each of the 18000 individual plants in the *Historia Plantarum* with at least one authoritative text, even for an entire community of botanists, we may therefore reasonably expect that by 1686, learning botany from books was seldom, if ever, practised in its idealized form.

Ray acknowledged the difficulties involved in becoming proficient in the 'proper' observation and identification of plants, which required "ceaseless endeavour and untiring effort" and took "a great amount of time and toil . . . to make even small progress in these studies."[20] Although he was convinced of the value of practical, first-hand acquisition of skills and knowledge, Ray also realized that only the most dedicated would pursue similar projects without encouragement and proper instruction. He claimed, "I felt a great desire to help the studies of others who might be filled with a love of *res plantae*, and I carefully considered how I could most effectively assist them so that they, perhaps less patient of labour than myself, would not be deterred by the endless succession of difficulties and falter in their studies."[21] The issue for Ray, of course, was to discipline the observer to see those characteristics, especially of the parts of plants, which would be useful and appropriate for correct specification. During the 1660s and the 1670s, Ray began a program to transfer his own natural history expertise to his friends and fellow naturalists. Scattered references throughout Ray's correspondence confirm that he was engaged in this process; at best, however, the correspondence provides only the most incomplete picture of how Ray communicated his knowledge. In 1667, he had encouraged Martin Lister "to see with your own eyes, not relying lazily on the dictates of any master but your self; comparing things with books and so learning as much as can be known of them."[22] In 1668, Francis Jessop wrote to Ray, having been only partially successful in following Ray's instructions, "I have done the most part of that you enjoyned me . . . but cannot separate the seeds as you directed."[23] Ray also counselled individuals on 'proper behaviour', and Lister assured Ray "I am as circumspect and careful not to impose upon myself and others as I can, and you have well-lessoned me to this purpose; and, amongst other things, I am extremely obliged to you for it."[24]

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[18] Raven, *John Ray, Naturalist,* p. 75.

[19] Letter to Willughby, 14 September 1661, *Correspondence of John Ray,* pp. 3-4.

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[20] *Ray's Flora of Cambridgeshire*, pp. 22- 23.

[21] Ray, '*Praefatio ad Lectorem*', *Catalogus Cantabrigiam*, n.p. "*Ex hoc tempore invasit nos vehemens desiderium aliorum etiam studia promovendi, siqui pariter res plantariae amore tenerentur, ne laboris minus patientes fatiscerent longa difficultatum serie deterriti, quaque his ratione commodissime inservire possimus solicite consideramus.*"

[22] Letter to Martin Lister, 16 June 1667, *Correspondence of John Ray*, p. 24.

The correspondence, however, tells us little of the skills Ray considered important for competency, how his methodology was transferred, or especially how the skills of plant identification were learned. We can gain valuable insight of these processes from a personal notebook kept by Ralph Johnson, Vicar of Brignal, who became an important contributor to Ray's projects. Johnson's notebook contains a series of botanical notes and observations dated 1671-1672, apparently written shortly after Ray's visit to the area in 1671.[25] The notebook as well as Johnson's subsequent correspondence emphasises the importance Ray placed on first hand experience of the living plants. More important, Johnson's notes also indicate that the practice of plant identification was not an unsystematic comparison of 'literature' and 'plant'. Rather, identification was a pragmatic approach whereby individual plants were identified by registering them against some conventional criteria or sorting mechanism. Johnson's notebook, then, may be understood as a unique exemplar of how Ray communicated the tacit knowledge required for competency. Further, the notes are important in that they enable a tentative reconstruction of a plant identification methodology using taxonomy.

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[23] *Ibid.*, letter from Francis Jessop, 8 November 1668, p. 33.

[24] *Ibid.*, letter from Martin Lister, 8 February 1670, p. 78

[25] Frank Horseman, 'Ralph Johnson's Notebook', *Archives of Natural History* 22(2) (1995), pp. 147-167.

I. Natural History Methodology

Rev. Johnson could have performed his botanical observations in a one-to-one comparison with authoritative texts in accordance with the idealized humanist method for plant identification. He had at hand the most important and relevant text for the identification of locally specific plant species, the illustrated *Gerardus emaculatus*, as Thomas Johnson's emendation of Gerard's *Herbal* was frequently known. Because it "would be tedious to . . . discourse upon the general division of Plants," the *Herbal* used only the most rudimentary sorting criteria for arranging plants: Book One contained grasses, grains, 'flags' and bulbs; Book Two contained medicinal and culinary herbs; Book Three was a miscellany of trees, shrubs, fruit bearing plants, roses, mosses, mushrooms, etc.; while Book Four contained anything not already described.[26] Rev. Johnson also possessed the most recent 'authoritative texts' on plants: Ray's own nonillustrated *Catalogus Angliae* (London, 1670), a gift from Ray himself, and Robert Morison's *Hortus Regius Blesensius* (London, 1669), a catalogue of plants cultivated at the gardens of Gaston, duke of Orleans at Blois, France. The texts of both Morison and Ray privileged morphological characteristics for plant identification and in the herbal tradition, listed and described individual plants alphabetically, with each plant designated by a unique, author-specific name. It is less certain that Johnson possessed John Parkinson's illustrated *Theatrum Botanicum* (London, 1640), which had divided plants into 17 'tribes' or families based on their qualities, as for instance "sweet-smelling herbs," "venemous sleepie and hurtful plants," "hot and sharpe biting plants," and so on.

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[26] Thomas Johnson, *The Herbal of John Gerard,* (London, 1636).

While Ralph Johnson had the appropriate texts for traditional plant identification methodology, his notebook provides no evidence that he used a system which directly compared text and plant to identify individual species. A more likely explanation of Johnson's method is that he was able to limit his textual search procedure by the recognition of the plant *genus* (the kind or class)[27] to discover its *species* (a subdivision of the *genus*).[28] Assuming that Johnson used his notebook as a *vade mecum*, we may speculate in some detail how a taxonomic system could be used to identify species. The first entries in the book are a scheme for plant classification. Following his scheme is a list of 27 genera of flowering plants and we may assume that Johnson was already familiar with their general physical description. Johnson then continued with a search list of nine flowering plants each representing an additional genus accompanied by site locations in Westmoreland, apparently compiled from plants recorded by Ray in the *Catalogus Angliae* (1670).[29] In other words, Johnson had a notebook which described 36 different genera: the 27 genera of flowering plants with which he was familiar, and the further search list of nine unfamiliar genera. Therefore, Johnson 'knew' 36 different classes of plants recognizable by an array of physical characteristics. At this point, it would be a fairly routine procedure to find the appropriate genus in whatever reference text he chose and compare his own observations with the textual description and illustration of individual species. If Johnson did not 'know' the genus of the plant he wished to identify, again the procedure would have been routine. In this case, the method would involve eliminating from his search the 'known' genera, and examining only the 'unknown'.

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[27] I use the term *genus* for convenience, to refer to a "kind" or "class". However, Ray's usage does not consistently conform to our modern understanding. Ray most frequently used *genus* to refer to 'kinds' of plants that agreed in many attributes, and to designate a ranking or class above species. However, he occasionally used the term to denote logical relationships, in a vernacular sense, and as a synonym for *classis*. See A. J. Cain, 'Thomas Sydenham, John Ray, and some contemporaries on species', *Archives of Natural History* 26(1) (1999), pp. 55-83, esp. pp. 68-69.

[28] Ray consistently used the term species in its sense as a biological species, that is, to designate "plants which originate from the same seed and propagate their species again by sowing." John Ray, 'A discourse on the specific differences of plants', *Philosophical Transactions* (17 December 1674), pp. 169-173; M. E. Lazenby, *Historia Plantarum Generalis of John Ray*, Unpublished PhD Dissertation (The University of Newcastle Upon Tyne, 1995), pp. 1164; A. J. Cain, 'Thomas Sydenham, John Ray, and some contemporaries on species,' pp. 62-67.

[29] See Horsman, 'Ralph Johnson's notebook' for more details of the notebook itself.

The exact details of Johnson's classification scheme need not concern us at this juncture, especially given the multiplicity of plant taxonomies in the latter seventeenth century, and Ray's caution in the *Catalogus Cantabrigiam* that "plants can be classified by various other methods, e.g., by the nature of their roots, stalks, flowers, seeds, or leaves, etc., but a detailed discussion of these topics is beyond the scope of my book."[30] However, using a taxonomy implies that nature was assumed to be orderly and stable and, further, that an orderliness underlay the structure of the world and the creations upon it. Therefore, a specific observation made upon a specific occasion was not a unique, unrepeatable and singular event experience, but one that could be replicated at another time and place by another individual with the appropriate credibility to witness and competently describe the observation. A stable and orderly nature ensured the validity of 'matters of fact' of proper natural history and provided some confidence in the certainty of the matter. Thus, reliable, empirical natural history depended upon more than civility and convention, but also rested upon some prior agreement about the way the world was or behaved for the most part, and the competency of individuals to properly observe natural phenomena.

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[30] *Ray's Flora of Cambridgeshire*, p. 135.

There was a more mundane and practical, but by no means trivial, dimension to using a taxonomic method to provide a means to recognize and identify plants. The use of a taxonomy was especially important when attempting to identify 'nondescripts', those plants growing 'spontaneously' in England that were not cultivated in gardens, known to herbarists or described in the literature.[31] In fact, contemporaries accorded special recognition to the discovery of novel plant species as knowledge new to natural philosophy. Johnson's contributions to the "first invention" of two plants which he called *Ornithogatu* (*Gagea lutea* L.) and *Pentaphyllum fruticosa* (*Potentilla fruticosa* L.), provide especially good examples of how taxonomy may have functioned to identify new, unusual or previously undescribed plants.

In 1672, Johnson sent Ray several plant specimens for which he had no positive identification, including "some ripe seeds of the faire vetch which grows in our wood, which appeares to be different from your vicia sivlt: multif: Max: ... and perhaps is not yet described,"[32] and "the seed of a plant which grows plentifully in the marshes of Cleeveland, & there goes by the name of water-parsnip but is not, I desire you satisfy me whether it be Alexanders, else I know not what to make it, the leaves does [sic] not at all agree with your account."[33] Johnson also included several specimens of a plant which he called *Ornithogatu.* In *Gerardus emaculatus,* the *Ornithogalum* designated several species of wild field onion, the most well known of which was the common Star of Bethlem which “grows in sundry places that lie open to the air, not only in Germany and the Low-countries, but also in England, and in our gardens very Common.” Ralph Johnson however, described the uncommon yellow, or wild, Star of Bethlem, known in the *Gerardus emaculatus* as the *Ornithogalum luteum sive cepe agraria,* and previously observed only in Somersetshire by Matthias de L’Obel (1538-1616).[34] Ray’s report of the species in the *Historia Plantarum* listed the only confirmed location of the plant near Johnson’s vicarage at Brignal and is a further indication that the species was rarely found in England.[35]

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[31] It is true that during Restoration England, it had become fashionable for gentleman to cultivate gardens of rare or curious plants. However, novel discoveries were considered especially important for the advancement of natural philosophy.

[32] Letter from Ralph Johnson to Ray, 29 March 1672; Horsman,'Ralph Johnson's Notebook', p. 156.

[33] *Ibid.*

Johnson’s description makes it clear that proper identification of the *Ornithogatu* was based on an array of physical attributes, such as root, leaves, flowers and seeds, as well as habitat and life cycle: “I expected the flowering of our *Ornithogatu* which this year was later than usual because of the black frosts in mid-March, it is just now in its glory, making a fair show among the Anemones in the skirts of our woods, it giveth seed both at root & top, for about the root especially after flowering time I find a great many little seeds (as in white saxifrage) each of which the next spring will be a plant. Last week by the carrier I sent you a great many rootes & several of them in flower with a great many of these root seeds, or little potential plants.”[36] Assuming that Johnson used the *Gerardus*

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[34] Johnson, *The Herbal of John Gerard,* pp. 165, 168.

[35] Ray, *Historia Plantarum,* vol. 1, p. 1154.

[36] Horsman, ‘ Ralph Johnson’s notebook’ pp. 156-157.

emaculatus as his primary reference material to identify the species, it is unlikely that he would have made a thorough search through the entire 850 chapters and thousands of individual plant descriptions with their illustrations. This would have been both time consuming and largely unproductive. Johnson may have determined the root structure of the plant, and not just its above-the-ground characteristics. In this case, he could have consulted the subsection in the book about 'Bulbous or Onion-rooted Plants', and compared his plant with the descriptions and illustrations of similar plants. The *Gerardus emaculatus,* however, did not sort all plants on the basis of physical characteristics and therefore this procedure could not be generally applied to locating and describing all plants. There are two practical possibilities, but the first method requires that Johnson 'knew' the genus of the plant and so was able to discover its species. That is, Johnson may have noted a physical similarity to the genus *Ornithogalum*, "in our gardens very common," and consulted the index of *Gerardus emaculatus* for either the Latin or English names, and then consulted these pages directly. Johnson however, was still a novice natural historian, and this method, although clearly the easiest to modern sensibilities, presupposes a competency in plant recognition that Johnson may not yet have acquired. An alternate and more probable tactic is that Johnson made a directed examination of *Gerardus emaculatus,* with his search strategy eliminating the categories of obviously dissimilar genera which he already 'knew', and focussing only on those 'unknown' genera which possessed similar physical characteristics. This procedure would have enabled him to find the relevant Chapter 92 describing the genus, read about the Star of Bethlem and its various species, and then compare his plant with the illustrations. This method is also consonant with Ray's own method of identifying unfamiliar plants which he first detailed in the *Catalogus Cantabrigiam*. "When I chanced upon some unknown plant," Ray described, "I first considered to what tribe and family it belonged or could be assigned . . . So that I first of all looked for it in the appropriate group, and in this way saved myself a great deal of trouble."[37]

While the above procedure could have been sufficient to find a plant already described in the literature, Johnson also identified a plant in his notebook as '*Pentaphyllum fruticosa*', which was an unknown species.[38] Again Johnson may well have troubled himself to randomly search the entire literature for a match, but in this instance, he would not have been able to find either an illustration or a written description of the individual species which fitted his observation. Alternately, Johnson could have searched his *Gerardus emaculatus* to find a chapter describing plants with a similar appearance, although this would have been more time consuming, especially since there was no separate section in the text with which Johnson could coordinate physical characteristics, as in the case of the 'bulbous rooted plants'. Further, in the *Gerardus emaculatus,* the *Pentaphyllum* is to be found in the Second Book of plants, concerned with "Herbes for meat, medicine, or sweet-smelling use" and is described in Chapter 382. Therefore, this latter method would have effectively meant a search throughout the first 531 chapters of Books One and Two until the relevant section of Book Two was encountered, and was a method which would have involved a comparison of the physical characteristics of the plants in each chapter. Needless to say, the procedure offered only a small advantage over a search of individual plants in the entire volume. The most likely explanation is that Johnson limited his search to plant genera which he already 'knew' possessed similar physical appearances, as Ray had also done when he "looked for it in the appropriate group" and in this way also saved a great deal of trouble.[39]

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[37] 'Preface to the Reader', *Ray's Flora of Cambridgeshire*, p. 23.

[38] Horsman, 'Ralph Johnson's notebook", p. 157.

Johnson's *Pentaphyllum fruticosa* resembled a genus of plants in England, commonly called 'Cinke-foile', 'Five finger grass', or 'Five leaved grass'. Cinke-foile likewise was named after this dominant physical characteristic in other languages as well, although the species may show both five- and seven-bladed leaf structures: in Italian it was called Cinqefolio; in French, Quinte feuille; in Latin, *Quinquefolium* and in Greek *Pentaphyllon*. *Pentaphyllum* grew widely throughout England in "low and moist medowes, upon bankes and by high ways" and the genus was well known among medical professionals for its virtues to cure the flux, to staunch bleeding, as a remedy for fevers and much more.[40] Thus, Johnson could have recognized the genus and then proceeded to

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[39] 'Preface to the Reader', *Ray's Flora of Cambridgeshire,* p. 23.

[40] Johnson, *The Herbal of John Gerard,* pp. 985-992.

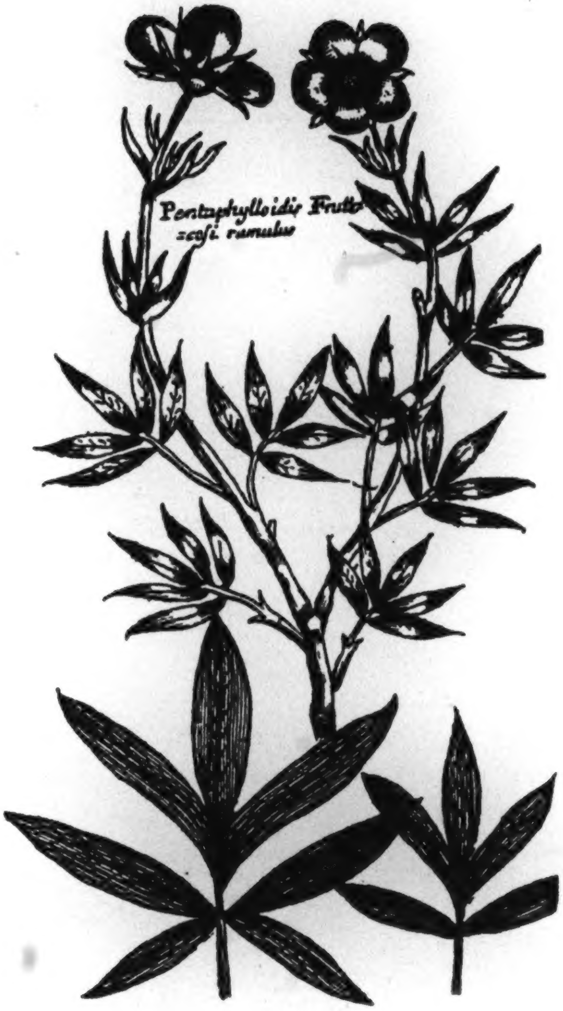
Pentaphylloidis Fruti
coſi ramulus

Fig. 4. *Pentaphylloides fruticosum.* John Ray, *Catalogue Plantarum Angliae* (London, 1677)

the index in *Gerardus Emaculatus* for reference to 'cinque foile'. A more likely procedure for an unfamiliar plant would have been to make a directed search of the text for the chapters describing plant genera with similar characteristics. Once Johnson found the appropriate genus, it would have been possible to make a limited comparison with individual plants species. At this juncture Johnson could have realized that his species was undescribed in the *Gerardus emaculatus* and consulting the Ray and Morison texts for additional species under the genera name *Pentaphyllum* would have confirmed its novelty.

There is further evidence that Johnson used a method which first delimited probable genus. Johnson named his unfamiliar species *Pentaphyllum fruticosa*, suggesting a physical resemblance to the 'cinke-foile' or 'five-finger grass' of *Gerardus emaculatus.* The second edition of Ray's *Catalogus Angliae* (1677) is noteworthy for its illustration of Johnson's discovery (Fig. 4). Ray acknowledged Johnson's invention and, ever scrupulous in matters of language, provided the species with the Latin name *Pentaphylloides fruticosum*, which in English he called the Tree or Shrub Cinquefoil.[41] *Pentaphylloides* is not found in *Gerardus emaculatus*, and Johnson could not have compared his specimen to this genus. Ray's new name no longer designated a 'five-leaved plant,' but rather, a plant with five 'leaf-like' structures. In fact, *Pentaphylloides fruticosum* possesses a compound leaf structure which may consist of five blades, but also shows a seven bladed variation in a distinct configuration which Ray deemed important for classification (see Figure 5).

Johnson's notebook provides the first, and at present only evidence, that Ray

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[41] Ray, *Catalogus Angliae*, p. 228-228. *"Hanc plantam primus observavit, nobisque ostendit, & descriptionen ejus a se elaboratam communicavit D. Johnson Eboracensis."*

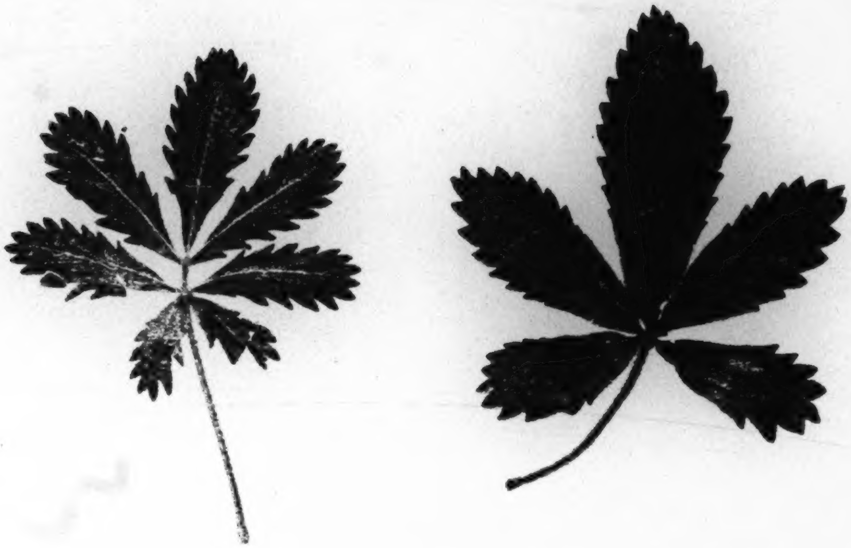

Fig. 5. A common cinquefoil.

instructed others in a similar method to identify plants, and Ray would later credit Johnson with the suggestion that "it would be to the benefit of the students of the subject if the plants were arranged according to the order of nature, rather than in alphabetical order."[42] As early as 1660, Ray's own description of his method for species identification in the *Catalogus Cantabrigiam* indicated that he had used a taxonomy to facilitate the task, especially to identify plants with which he was unfamiliar. By the 1670s however, and especially when we consider the enormous increase in the number of new plant species discovered and described during the century, the utility of classifying plants for the purposes of plant identification was already recognized. In his *Catalogus Angliae* (1670) Ray recommended classification precisely for such a purpose, "And besides, he who applies himself to establishing the methods [systematic and classificatory accounts] of the sciences and disposing the particular things into their places (and what use that is of for learning them more quickly, understanding them more clearly, and retaining them [in the memory] longer, I judge that no one [even] mediocrely versed in letters will not know) must have all the species in ready cash [*in numerato*], so that he can define any one genus by its essential and characteristic notes."[43] Similarly, Robert Morison's *Plantarum Umbelliferarum Distribution nova* (London 1672), which classified umbelliferous plants according to the structure of their seeds, was advertised as a "way the Students of Botanicks will henceforth be able to learn from Nature itself, with much order, clearness, and ease of memory, all sorts of Plants by their supreme *genus's*, intermediate kinds, and lowest *species,* and their particular varieties; without a tedious perusal of voluminous books, and an irksome expense of time."[44]

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[42] Ray, Preface, *Synopsis Methodica Stirpium Britannicarum* (1690), translated by Horsman p. 149.

By 1684, Ray was involved in the preparation of the *Historia Plantarum* which both described and classified plants species according to the maximum natural affinity between species. Ray justified the project and especially the effort entailed in classifying 18000 species, in part, "to facilitate the learning of plants, if need be, without a guide or demonstrator, by so methodizing of them and giving such certain and obvious characteristic notes of the genera, that it shall not be difficult for any man that shall but attend to them, and the description, to find out infallibly any pl[ant] that shall be offered to him."[45] In 1694, William Wotton described the utility of using a taxonomic method for identifying plants precisely.

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[43] John Ray, 'Preface', *Catalogus Plantarum Angliae et insualarum adjacentium,* (London, 1670) sig A4-a4v. "*Preterea qui scientiarum methodos instituere, & suis res singulas locis disponere aggredietur (Quod quanti usus sit ad eas citius addiscendas, clarius intelligendas & diutius retinendas, neminem in literis mediocriter versatum latere arbitror) species onmes in numerato habeat oportet, ut possit unumquodque genus notis suis essentialibus & charactisticis definire.*" Trans. A. J. Cain, 'Thomas Sydenham, John Ray and some Contemporaries on species', *Archives of Natural History* 26(1), (1999), p. 63.

[44] *Philosophical Transactions* No. 81, March 25, 1762, p. 4028.

> This was, to digest every Species of Plants under such and such Families and Tribes; that so, by the help of a general Method, taken only from the Plants themselves, and not from any accidental Respects, under which they may be considered, once thoroughly understood, a Learner might not be at a Loss upon the Sight of every new Plant that he meets with, but might discern its General Head at first View; and then by running over the Tables thereunto belonging, might, at last, either come to the particular Species which he sought for, or, which would do as well, find that the Plant before him was hitherto undescribed, and that by it there would be a new accession made to the old Stock.[46]

Taxonomy became widely accepted as the most efficient means to identify plants in England. In 1719, the advertisers for the English version of Tournefort's *Botanical Institutions,* recommended the text because the Frenchman's method was quick and easy.[47] Tournefort explained the ease of his method for "those who are true lovers of Botany, by genius and inclination led to the useful knowledge of plants, may, without the assistance of any Master, in a very little time accomplish themselves therein, by fixing in their memory the different forms of fourteen flowers only, which one hour, or two at most, will suffice to rivet there; for every flower is either composed of leaves, or having none, consists only of some small threads of Capillaments."[48]

By the early eighteenth century the time-honoured method of 'learning botany from books' was no longer the standard or accepted practice. Indeed, "Geometry and history may be learned in the lazy Solitude of the Closet; Astronomy, Chymie and Anatomy require but small Action, but Botany is not to be attained in learned ease and inactivity; the only books that can instruct in this Science lie dispersed over the whole Surface of the Earth."[49] However, competency in the discipline involved the ability to reliably identify plants. In England, Ray developed taxonomic methods for this purpose, and its utility for becoming skilful in the identification of plants cannot be underestimated.

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[45] Letter to Hans Sloane, 11 February 1684, *Correspondence of John Ray,* pp. 139-140.

[46] Wotton, *Reflections upon Ancient and Modern Learning,* p. 256.

[47] Publisher's Preface, *The Complete Herbal or the Botanical Institutions of Mr. Tournefort, Chief Botanist to the Late French King carefully translated from the Original Latin with large additions from Ray, Gerard, Parkinson and others, the most celebrated authors,* Vol. 1 (London: printed for R. Bonwicke, Tim Goodwin, John Walhoe, Sam Manship, Rick, Wilkin, Benj. Tooke, Ralph Smith and Tho. Ward, 1719). p. 2. The classification was based on 14 different flower shapes with a secondary sorting criteria using seeds.

[48] *Ibid.,* Author's Preface, p. 7.

II. Vocabulary

Ray also stabilized a precise and technical language to communicate the increasingly specialized material required for standardized plant descriptions. In the *Catalogus Cantabrigiam,* Ray had included a glossary or "*Terminorum quorundam*" of botanical terminology. The glossary included definitions for basic terms such as *bulbus, fructus* and *herba,* and for more esoteric words such as *calyx* (the cup which encloses the flower), *internodium* (the place between two joints), *liber* (the innermost bark of a tree) and *uculus* (a bud for inoculation). Ray's glossary was not original, and many of the terms were acknowledged to be from an unpublished manuscript by Joachim Jung, which in turn may have drawn upon an emerging tradition among continental botanists.[50] The botanical notes compiled by Ralph Johnson consistently used Ray's terminology to describe the parts of plants, and provides a striking and early example of the introduction of this practice.[51] However, Ray continued to develop and refine the technical vocabulary, and widespread dissemination of the terminology was achieved in 1686 with the printing of the first volume of his *Historia Plantarum.* By 1710 John Harris's *Lexicon Technicum*, a useful and frequently reprinted dictionary of eighteenth-century scientific and technical terminology, contained "a pretty exact Botanick Lexicon," which included virtually the entire vocabulary used by Ray and his community, with some additional definitions primarily from Nehemiah Grew's *Anatomy of Plants* (1682).[52] Thus, Ray's conventional definition of botanical terms and their subsequent adoption within the community ultimately resulted in the specialized technical vocabulary which was to be used within the scientific culture of eighteenth-century botanists.

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[49] 'Publisher's preface', *Tournefort's Complete Herbal,* p. 2.

[50] [Ray], *Catalogus Cantabrigiam*, pp. 84-98. Ray compiled the definitions from several different sources and authors, including entries taken from an unpublished vocabulary of morphological terms developed by Joachim Jung, which he acknowledged receiving from Samuel Hartlib, "*Joachimus Jungius Lubecensis in Isagoge Phytoscopica nondum edita nobia a Cl.Viro D. Samuele Hartlib communicata caulem its definit*" p. 87. Ray continued to refine the vocabulary and included a slightly revised section in the *Historia Plantarum.*

[51] Horsman, 'Ralph Johnson's Notebook', p. 155.

The use of an agreed-upon, stipulated terminology enabled descriptions of plants to be precisely linked to observations. Further, the benefits of a standardized technical vocabulary are especially important for specifying plant identities; if the same word always designated the same 'thing', one of the customary causes of disagreement about plant identities could be eliminated. While naturalists could indeed compare plant illustrations to learn to see the details which distinguished one plant from another, consider the difficulties which arose when nonstandardized descriptive terms were used to specify the identity of the same plant. Karen Reeds describes the various ways to describe a single feature, namely the leaves of a plant known by Dioscorides by the name '*Dracontea*', but also known by other authors as *Drakontaia, Dracontia, Draguntea, Dracontium, Dracunculus, Serpentina, Serpentaria, Viperina, Colubrina, Basilica, Dragon* and *Luf.* Once a novice negotiated the nomenclature for this plant, the next challenge would be to compare the different written descriptions in the botanical texts. Five different authors, each claiming to have based their claims on personal acquaintance with the living plant, described the leaf of the *Dracontea* variously as "deeply-split," "like *Rumex*," "like *Arum*,"

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[52] John Harris, *Lexicon Technicum or an Universal English Dictionary of Arts and Sciences explaining not only the Terms of Art but the Arts Themselves* (London 1704). My examination is from the 4th edition (London 1725) where Harris explicitly claimed to have followed Ray, with some additions from Tournefort; many terms describing internal features of plants came from Grew. Sig 7Av.

"like ivy" and "like Fingers of a hand." Each of the authors also provided illustrations of the species with a variable degree of accuracy, and so with some effort, individuals would be able to provide at least a tentative identification.[53]

Illustrated botanical texts, however, could be very expensive, and their size alone would make them inconvenient for botanizing in the field. Furthermore, illustrated works were not always available and, in fact, Ray's own texts did not contain illustrations. Therefore, it was crucial for Ray to be able to describe individual species with as much clarity and precision as possible. To do this, Ray occasionally employed terms that may have been in common use. For instance, the term 'anther' was one of the words traditionally used by herbalists to designate internal organs of flowers, but other possible terms for the same structures included 'apex' or 'apices', 'theca', and 'capsula'. 'Anther' was also a term used to describe the stamen itself, as for instance in saffron.[54] A single word then, could be used to designate different parts of the same plant; or, the same part could be known by different words. Ray stipulated and consistently employed the word *'antherae'* or in English 'anther', to designate the apices at the tops of the stamens.[55] By the early eighteenth century, the botanical meaning of the particular term 'anther' had stabilized in accord with Ray's definition, that is, "those little Knobbs which grow on the tops of the stamium of flowers."[56] Ray also stipulated meanings for the various other parts of plants. For instance he designated the term 'calyx' to refer to the bud, or more precisely the "cup which contains or encloses the Flower in any Plant; and is sometimes used for the flower itself when its figure is like that of a rose, and not yet having its leaves."[57] Prior to Ray's stipulation for 'calyx', there was no common English usage for this term.[58] Many additional examples of individual terms are possible, but not necessary. What is significant is the conventional linkage of specific 'things' with specific 'words' and the subsequent adoption of the practice within a local community.

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[53] Reeds, 'Learning Plants from Books,' *Botany in Medieval and Renaissance Universities,* pp. 147, 162.

[54] *OED,* *sv* anther.

[55] Ray, '*Terminorum quorundam & Vocum generaliorum interpretatio & explicatio brevis*', *Catalogus Cantabrigiam.*, p. 85. "***Anthera.*** ***Offic.*** *Sunt summitates seu cacuminula in florum medietate staninibus incumbenentia.*"

III. Further orders

Ray's unique nomenclature also became the standard system of naming in England, and the origins of this tradition are also clearly seen during the 1670s. Ralph Johnson, for instance, began to use Ray's polynomials in the entries to his notebook which date from 1671.[59] Other individuals quickly began to adopt the practice. For instance, Thomas Lawson entered *Pentaphylloides fruticosum* into his own notebook probably in 1677, following Ray's designation in the *Catalogus Angliae*, although it is clear from Lawson's notes that he had first been shown the same plant, then called *Pentaphyllum fruticosa,* by

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[56] John Harris, *Lexicon Technicum,* sv *anther.*

[57] *Ibid.,* sv *calyx.*

[58] Ray, *'Terminorundum Quorundum', Catalogus Cantabrigium: "folliculus seu involucrum floris priusquam dehiscate praecipue Rosae; interdum flos ipse rosae connivens & nondum expansus. At nunc frequentissime accipitur pro folliculo, quo flos primum deinde semen herbarum & fructus arborum cooperitur.* The Cup enclosing or containing the flower" ; Harris, *Lexicon Technicum,* sv.'*calyx*".

[59] Horsman, 'Ralph Johnson's notebook', p. 154.

Ralph Johnson.[60] As early as the 1670s then, Ray's nomenclature began to be adopted among the network, and this practice persisted. Even at the end the eighteenth century, it is Ray's polynomials that are found in most standard British botanical texts; late in the century, Linnaean binomials were added to Ray's.[61] The adoption of a standard system of naming had great benefits for English botany; individuals could begin to have some degree of confidence that a single name referred to a particular species of plant.

Ray's established practice for describing the parts of the plant followed a sequence beginning with the root (*radix*), then moving to the stem (*caulis*) and finally the flower (*folia*) if present. Similarly, he followed a particular sequence in the descriptions of the flower itself: in order he described the *calyx, petala, stamina, antherae* and *stylii* (a part which Ray called the "middle prominent part of the Flower of the Plant, which adheres to the Fruit or Seed: this usually long and slender, whence its Name of Stylus").[62] This sequence represents a logical physical order, moving from the root to the flower of the whole plant, and from the exterior to the interior of the flower. Johnson's notebook reveals another aspect of Ray's influence, and Johnson similarly followed Ray's order of description and treated the root and stem before the flower and its parts are described.[63]

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[60] Horsman, 'Ralph Johnson's notebook', Fig. 4, facsimile reproduction of pp. 168 and 169 from Lawson's botanical notebook, which reads "nigh Brignall vide in hortum meum translatum", p. 157.

[61] John Jacob Dillenius, *Horti Elthamensis Plantarum Rariorium Icones et Nomina. Descriptarum Elthami in Cantio in Horto Viri Ornatissimi atque Praestantissimi Jacobi Sherard, M.D. Soc. Reg. Et Coll. Med. Lond. Soc. Additis Denominationalis sub Linnaeanis* (Ludguni Batavorum: Comelium Haak, 1774). Ray's name for each plant is used, followed by the Linnaean binomial. William Curtis, *Flora Londoniensis or Plates and Descriptions of such Plants as grow wild in the Environs of London with their Places of Growth, and Times of Flowering; their several Names according to Linnaeus and other Authors; with a particular Description of each Plant in Latin and English to which are added Their several Uses in Medicine, Agriculture, Rural Oeconomy, and other arts.* (London 1777). Curtis first lists the Linnaean designation for each plant, then Ray's name, and then the synonyms of other authors, i.e. Gerard, Fuchs, Parkinson, Bauhin, etc.

[62] In modern terms, the extension of the ovary which bears the stigma. Ray, *Ibid,* "*in Phytologia est partis floris medium ejus occupans & rudimento fructus aut seminis cohaerens. Dicitur stylus quia in longitudinem haerens. Tenuem plerunque extenditur.* Jun. Vid. Lib. 1, cap. 10, pag. 18"; Harris, *Lexicon Technicum, sv style.*

Sustaining the Community

Ray's importance in 'ordering' his community involved establishing an efficient method for plant identification, stipulating a conventional vocabulary and imposing a common nomenclature. However, neither the existence of the natural history network nor Ray's ability to establish an identifiable discipline should be taken for granted. The deployment of specific social strategies was also required to encourage the continuation of community activities, and Ray self-consciously cultivated his friends and correspondents to maintain their cooperation. The network operated much as other social relationships of the period, and was based on an array of reciprocal arrangements and gift-giving. Recent scholarship has enhanced our understanding of how the patronage system functioned as a form of social interaction, and especially how the mutual exchange of gifts was a manifestation of a complex system of obligations.[64] The natural history network established by Ray, however, does not entirely 'fit' this well-known model of patron-client interactions, in particular because Ray himself wore the mantle of patron uneasily. He was not wealthy, powerful or capable of granting favours to his friends. Nevertheless, many of the attributes we have come to associate with the patronage system are apparent.

The network was grounded in a complex 'economy of exchange' which operated on many levels. Ray's correspondence captures the many gifts of books that Ray presented to his friends and helpers. There was, naturally, an active trade of seeds and specimens which occurred between Ray and his friends, but also a vigorous sharing was conducted between other members of the network: Ralph Johnson provided plants and seeds which Thomas Lawson planted in his garden; John Banister sent specimens from Virginia for Henry Compton's extravagant garden at Fulham; Hans Sloane sent Jamaican plants to Arthur Rawdon in Ireland and to Francis Willughby's son, Thomas, at Middleton, among many other examples. There was also a strong element of *quid pro quo* which governed some interactions; including the exchange of information, a valuable commodity in itself. In 1670, for instance, Martin Lister clearly expected a gift of an equivalent 'value' when he wrote to Ray, "when you please to send me an account of the acid liquor of pismires, I will return something concerning the gilding of a chrysalis, which is a pretty phenomena."[65]

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[63] Horsman, 'Ralph Johnson's notebook', p. 155.

[64] Most recently Graig Muldrew, *The Economy of Obligation: The Culture of Credit and Social Relations in Early Modern England* (London: Macmillan, 1998), esp. pp. 148-157; see also Paula Findlen, *Possessing Nature*, pp. 346-292; Bruce T. Moran, *Patronage and Institutions 1500-1750* (Woodbridge: Boydell Press, 1990); Mario Biagioli, 'Galileo's System of Patronage', *History of Science* 29 (1990), pp. 1-61.

Ray however, had one gift of inestimable value which he was alone able to deploy, and this was to bestow the gift of reputation which was perhaps the most valuable commodity of seventeenth-century England. A personal reputation for learning and erudition was becoming increasingly important as a manifestation of honour and a recognition of virtue, and part of Ray's capacity to confer credit was also vested in his own public identity and personal character. Social credit and individual reputation of course, rested on an array of attributes influenced by fluid public judgments about honour, truth and virtue. The possession of social credit therefore was especially vulnerable to the opinion of one's friends and associations.[66] Ray's intentions to publicly acknowledge the intellectual products of his friends in terms of the social expression of virtue are captured in an early letter to Edward Lhywd, who first contributed to the botanical project in 1689. "I should be ungrateful and unjust," Ray wrote,

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[65] Letter from Martin Lister, 22 December 1670, *Correspondence of John Ray*, p. 74.

> should I not acknowledge and commend your candour in so frankly and readily communicating your learned and accurate observations and discoveries to an unknown person, to accomplish his work. I shall be careful to doe you right, and not rob you of any part of that honour and thanks that is due to you from the curious and ingenious, or any other that may purchase and make use of the *Synopsis Methodicus Stirpium Britannicarum.*[67]

The solution Ray devised was a form of authorial citation and acknowledgement which became a trademark of all his publications. As a way of providing 'credit' to his friends and collaborators, and recognition of their efforts in perhaps the only way available to him, Ray scrupulously acknowledged each and every individual contribution. Always generous to those who offered assistance, by 1686 Ray's citations were often accompanied by lavish praise for his friends and especially for the 'first inventions' or discoveries of new plants. In the *Praefatio* to the *Historia Plantarum* (1686), Ray provided formalized acknowledgements to his contributors. The citations which accompanied individual plant descriptions even more clearly illustrate his practice. For instance, in 1686 Hans Sloane was a young and relatively unknown physician in London, newly elected to the Royal Society and a recent recruit to Ray's community. Among the many references to Sloane and his contributions, Ray praised him as *"Erudisissimus Vir & rei herbaria peritissimus D. Hans Sloane M.D. & Amicus noster singularis*" (a man most learned and extraordinarily skilled in *res herbaria*, Hans Sloane MD and our singular friend),[68] "*ingeniossi. Vir & eximius Botanicus D.* Hans Sloane" (a most talented man and exceptional botanist D. Hans Sloane)[69] and "*eruditissimo & amicissimo viro D. Hansio Sloane*" (that most learned and willing gentleman, Hans Sloane).[70] Later commentators seldom failed to remark on this aspect of Ray's practice. In 1720, the London physician Patrick Blair, who otherwise had little praise for Ray, admitted "Mr. Ray, I say, is so just to his other Correspondents, that he mentions every one of them with that just Regard and Gratitude they truly deserve at his Hands."[71] Even late in the eighteenth century a commentator remembered that "nothing forms a more striking feature in Ray's character, than the unreserved and abundant commendation, which he always gave to his friends and fellow labourers."[72]

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[66] Anna Bryson, *From Courtesy to Civility: Changing Codes of Conduct in Early Modern England* (Oxford: Clarendon Press, 1998), pp. 232-241; and A. J. Fletcher, 'Honour, Reputation and Local Officeholding in Elizabethan and Stuart England', *Order and Disorder in Early Modern England*, eds. Anthony Fletcher and John Stevenson (Cambridge: Cambridge University Press, 1985), pp. 92-115.

[67] Letter to Edward Lhwyd, 21 June 1689, *Further Correspondence of John Ray*, ed. R. W. T. Gunther, (London: Ray Society, 1928), p. 188.

What is more important, however, individual recognition of particular contributions became stabilized as common botanical reportage and established as a feature of natural history texts in general. Blair, who aspired to reinstate the rival Morisonian tradition, similarly promised due recognition to contributors, "for the furtherance of so useful an Undertaking, I solemnly invite, desire and earnestly Entreat of all Eminent and Expert Botanists, all Physicians and apothecaries, all curious and expert gardeners, or any other ingenious Persons who shall observe anything relating to the Botanical, Physical, Pharmaceutical or Chemical Part of these plants, or what may concern their Culture and management, that they would be pleased to communicate such their Curious Remarks to me, and I shall take special care to have them published in their name, and after what manner they shall desire."[73] Blair was unsuccessful in displacing Raian botany, but when William Curtis was beginning the first botanical periodical later in the eighteenth century, he similarly encouraged contributors to the journal by promising "any information they shall be pleased to communicate, shall with those favours already received from diverse friends, be gratefully acknowledged."[74]

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[68] Ray, *Historia Plantarum*, Vol. 1, p. 228

[69] *Ibid.*, p. 199.

[70] *Ibid.*, p. 939

[71] Patrick Blair, *Botanick Essays* (London, 1720), p. 105.

[72] Sir James E. Smith, *The Encyclopaedia or Universal Dictionary of Arts, Sciences and Literature*, First American Edition, Vol. XXX (Philadelphia, Samuel F. Bradford, and Murray, Fairman and Co., 1812), sv Ray.

Ray was able to unite and 'discipline' a diverse array of physicians, apothecaries, gentlemen, clergymen and gardeners by providing the only 'gift' he possessed. Ray publicly acknowledged individual reputation in the most generous terms. Further, his acknowledgements far surpassed the formulaic "*clarissimus viro*" found in many contemporary texts. It is hardly surprising, therefore, that Ray and his works enjoyed the support of the many individuals so highly praised in his books.

Expanding the Community

By the end of the 1670s, Ray had discontinued lengthy excursions throughout

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[73] Patrick Blair, *Pharmaco-Botanologia or an alphabetical and classical dissertation on all the British Indigenous and Garden Plants* (London: G. Strachan and J. Innys, 1723), p. xi.

[74] Curtis, The Preface, *Flora Londoniensis*, n.p.

England to search out new plants, and he came to rely more heavily on his friends to supply observations of plants and animals. By this time, however, individuals were also being recruited to Ray's projects by other members of the network. For instance, Thomas Lawson, the Quaker clergyman, was posthumously acknowledged for his botanical acumen in the *Fasiculus Stirpium Britannicarum* (1688) by "*Joanne Raio & ab Amicis*"[75] and remembered as a "diligent and skilful botanist" in Ray's *Synopsis Methodica Stirpium Britannicarum* (1696).[76] Lawson was first encouraged in botanical studies by Ralph Johnson about 1674, and in all probability learned the skills of plant identification from him.[77] Martin Lister became acquainted with Edward Lhwyd during the 1680s at Oxford and appears to have introduced him to Ray's methodology and analysis. Lhwyd subsequently began an extensive correspondence with Ray, contributed to many of Ray's botanical works and in turn he also recruited William Sherard, then of Oxford University, to the natural history network.[78] Proper Raian methodology is especially important when evaluating Lhwyd's contributions to the natural history project of the seventeenth century, not only in his role as curator of the Ashmolean Museum at Oxford, but also as author of the *Lythophylacii Britannici Iconographica* (1699), a taxonomic work on 'formed stones' and fossils, as well as the *Archaeologica Britannica* (1707), Lhwyd's philological field study of the Celtic language.[79] In the 1680s as well, a number of individuals already concerned with natural history initiated correspondence with Ray, including Tancred Robinson and Hans Sloane. Sloane and Robinson had been educated as physicians and learned their botanical training from Tournefort at the Jardin du Roi in Paris, and both individuals would become important within Ray's circle and especially active in promoting Raian natural history.

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[75] John Ray & *ab amicis*, *Fasiculus Stirpium Britannicarum, post editum Plantarum Angliae Catalogum Observatarum* (London, 1688).

[76] Charles Raven, 'Thomas Lawson's notebook', *Proceedings of the Linnean Society of London* 160 (1948-49) pp. 3-12; Raven, *John Ray, Naturalist*, p. 233-234.

[77] Horsman, 'Ralph Johnson's Notebook', p. 160.

[78] Ray & *ab amicis*, *Fasiculus*, pp. 2, 3, 14, 18, 20; throughout, Lhwyd is acknowledged as 'Lloyd'.

Ray continued to invite new individuals to join the network. In 1685 he wrote to Robinson "I understand . . . that you have some acquaintance with Dr. Covell [a Fellow of Christ's College Cambridge (1659-82) and Master (1688-72)]; now he might contribute somewhat to our History, he having described and drawn himself many plants observed by him in Thrace, Greece and Asia the less. I have employed Mr. [Peter] Dent [an apothecary at Cambridge] to intercede with him . . . I was informed by Mr. Dent that he was to come over with the Princess of Orange, and that he (Mr. Dent) intended to wait upon him at London."[80] Shortly thereafter, Ray wrote Robinson with the news that "I have from Mr. Dent directions how to address a letter to Dr. Covell, which I intend to do."[81] Ray successfully enlisted Covell, whose observations were cited in the first volume of the *Historia Plantarum,* printed in the following year.

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[79] Marcus Hellyer, 'The Pocket Museum: Edward Lhwyd's *Lithophylacium*', *Archives of Natural History* 23(1) (1996), pp. 43-60, 1996; Graham Parry, *The Trophies of Time: English Antiquarians of the Seventeenth Century* (Oxford, New York: Oxford University Press, 1995), p. 346; Cram, 'Ray and Willughby and Linguistic Field Research', p. 233; Robert F. Brynley, 'In search of Edward Lhwyd', *Archives of Natural History* 16(1) (1989), pp. 49-57.

[80] Letter to Tancred Robinson, 29 April 1685, *Further Correspondence*, pp. 145-146.

[81] *Ibid.*, p. 146.

A particularly revealing example of how the entire membership of the network operated to sustain itself involves Henry Compton, bishop of London, who was well known for his interests in *res herbaria.* At his famous garden at the bishop's palace at Fulham, Compton welcomed a wide company of plant enthusiasts, including his friend John Ray, but also Leonard Plukenet, James Petiver and many others, and Compton's gardener, George London, later became Director General of Gardens and Plantations to William III.[82] In 1679, Compton was seeking a ministerial candidate for the North American colony of Virginia over which he had episcopal responsibility and the successful applicant for the position was John Banister (1650-1692), Chaplain at Magdalen College, Oxford. At Oxford, Banister would have been able to learn practical plant skills from Jacob Bobart, curator of the Oxford Physic Garden as well as from Robert Morison, Professor of Botany there. Undoubtedly, Banister was also acquainted with another of Ray's contributors from Magdalen College, Rev. William Browne. That Compton viewed the appropriate qualifications for a clerical appointment in the new world to include skill in the observation and identification of plants may explain why Morison wrote to Compton on behalf of Banister's application.[83] By 1680, Banister was also corresponding with Ray and regularly sending him seeds from Virginia as well as supplying Henry Compton with rare specimens. His individual contributions were acknowledged by Ray in the *Historia Plantarum,* and at least some of the plants Ray described from the bishop's garden were from Banister.[84]

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[82] Britten and Boulger, *Biographical Index*, p. 192.

[83] Joseph and Nesta Ewan, *John Banister and his Natural History of Virginia 1678-1692* (Urbana, Chicago, London: University of Illinois Press, 1970), pp. 31-35. See also Banister's letter from Virginia 6 April 1679, "To my much Esteemed friend Dr. Robert Morison, Worthy sir, - the Kindness you have shewn me when at Oxford and the benefit and Satisfaction I ever received from your free and communicative Nature deserves more than an Annual tribute of thanks...but I should adde stupidity to ingratitude and show myself a fool as well as a Clown if I gave you not some Acct of the Country I am now in &c so ... [I] endeavour at least in some measure to make good the character you were pleased to give to my Lord of London." p. 38.

In general, the social distribution and educational qualifications of Ray's network by 1688 looked very similar to the membership of the 1660s and 1670s. In the period 1662-1678, a total of 27 individuals were identified as contributing to Ray's various projects; by 1688 it is possible to identify a further 35 individuals. To qualify as part of Ray's network, only those individuals thanked or acknowledged by Ray as personally contributing to the projects are included. I have excluded instances where Ray cites the existing and rapidly expanding literature on natural history, as this clearly was information in the public domain. Therefore, I have omitted Ray's numerous citations from Nehemiah Grew's *Anatomy of Plants* (1682); although Grew was also a Fellow of the Royal Society, there is no evidence that he and Ray collaborated or communicated and, indeed, Grew's approach to natural history differed substantially from Ray's. Similarly, Ray's citations of Robert Boyle, Robert Hooke and John Evelyn do not qualify them as part of Ray's community. Even though Ray may have been acquainted with all or some of these individuals through the Royal Society, his citations do not acknowledge them as 'friends' and no correspondence exists which indicates a relationship was maintained.

The noteworthy feature of the composition of the early community had been their affiliation with Cambridge University. Certainly, the individuals involved by the 1680s shared a broadly similar educational background, but attendance at Cambridge no longer dominated the university experience. Another similarity is that individuals publicly acknowledged as nonconformists continued to be conspicuous by their absence. The Quaker clergyman, Thomas Lawson, is the only positively identified non-Anglican in the group, although Lawson had also been a contemporary of Ray's at Trinity College during the Interregnum. By the late 1680s, the significant new factor in Ray's community was involvement in the Royal Society. In Ray's early group, only six individuals other than Ray himself were or became Fellows of the Royal Society. By 1688, the community included a further 13 individuals who either were Fellows of the Society or would be elected to the Society; an additional two individuals were proposed as members but were not elected (Huntington and Charlton). Making adjustments for Willughby's death and Skippon and Courthope's withdrawal from Society involvement, the tally in 1688 was 16 Fellows. Further these individuals represented some of the most active members of the Royal Society during the 1680s and 1690s, and so were especially important in defining the activities of the Society at the close of the seventeenth century. See Table II.

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[84] *Ibid.*, p. 74; Ray, *Historia Plantarum* Vol. II, pp. 1798, 1845, 1857 1850, 1874, *et passim.*

Conclusion

By 1690, then, Ray had consolidated a definable community of specialist natural historians who were committed to precise first-hand observations using an agreed upon methodology. By 1690 as well, the community had agreed upon a technical vocabulary and nomenclature, established a textual tradition, and was maintained through a set of specific social strategies. Members of the community shared similar social standing and university education and with few exceptions, a similar political and religious background. What is also important is that members of the network saw themselves, and began to be seen by others, as forming a specialist community with particular expertise in natural historical activities. Especially for those members active in the Royal Society, there was also a deliberate effort to perpetuate their communal identity and expand its membership by the promotion of specific texts on the subject and by the establishment of a training facility to produce further 'experts' in the field, but especially by a determined program to valorize the 'father' of their discipline, John Ray.

TABLE II

NATURAL HISTORY NETWORK BY 1690[85]

Profession/Social Standing	1662-1682	# FRS	1686-1690	# FRS	TOTAL (1662-1690)	TOTAL FRS (ca. 1690)
Physicians/ Apothecaries	9	3	12[86]	7	23	10
Clergymen/Academics	8	-	12[87]	4	19	4
Gentlemen	8	3	6[88]	2	13	2
Botanical 'Experts'	2	-	2[89]	-	4	-
Others/Unidentified	-	-	4[90]	-	4	-
Total	27	6	35	13	60	16[91]

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[85] This includes those individuals acknowledged by Ray in the first two volumes of the *Historia Plantarum* (1686 and 1688), *Willughby's Historia Piscium* (1686), the *Fasiculus Stirpium Britannicarum* (1688) and the *Synopsis Methodica Stirpium Britannicarum* (1690). Note that the Total column excludes Francis Willughby (d.1672) and William Brown of Oxford (d. 1678).

[86] Sloane (FRS), Robinson (FRS), Plukenet, Slare (FRS), William Sherard (FRS), Palmer, Page and Goodall were physicians. Dent, Doody (FRS) and Petiver (FRS) were apothecaries. Mapletoft (FRS) was both a clergyman and a physician. In the *Historia Piscium,* Ray also identified 'Clarissimus D. Willis (FRS), 'Clarissimi viri D. Tyson (FRS), and 'Clarrissi. Viro D. Georgio Ent (FRS), however no correspondence exists to warrant their inclusion in the community..

[87] Compton, Nicholson (elected FS 1705), Wheeler (FRS), Huntington (proposed by Sloane but not elected), Covell (FRS), Banister, Lhwyd, Stephens, Dodsworth, Plot (FRS); Langley and Mayfield were identified in the *Historia Piscium.*

[88] Hatton, Charlton (proposed by Lister but not elected), Charles Howard (FRS), Aubrey (FRS) Wilmer, Birch.

[89] London and Watts.

[90] Daire, Trapham and Richer; the latter identified as *"a Rege misso in Adadeam & Cayannam"*; Ray, *Historia Plantarum* Vol. II, p. 1868; Robert Thorley was cited in the *Historia Piscium.*

[91] Includes Lister, Needham and Allen from the early network, but excludes Willughby (d. 1673), Courthope and Skippon who had been expelled from the Royal Society during the 1670s.

CHAPTER 8

Honour and Order: Robert Morison 'The King's Botanographer' and John Ray 'socius regius'

The study of natural history became one of the best defined activities within the philosophical culture of late seventeenth-century England. Natural historians generally were concerned with the universal validity of experiential, demonstrative knowledge of the natural world and some also began the philosophical process of attempting to understand nature by delineating the order and relation of things. The natural philosopher John Ray had played a pivotal role in the formation of a natural history network and in the transmission of specific practices and protocols within a designated community. There was nothing inevitable however, about the shaping of natural history along a Raian trajectory in the closing decades of the seventeenth century. In particular, the Scots physician Robert Morison (1620-1683) was equally well qualified to direct the subsequent course of natural historical activities. However, by the 1690s, the discipline of natural history looked much like the undertaking which had been promoted by John Ray during the 1670s and 1680s. I suggest that Morison was ultimately unsuccessful in making a decisive mark on the enterprise, at least in part, due to the vagaries of public opinion concerning honour, truthfulness and scholarly integrity.

Proper knowledge of nature involved sound philosophical principles, the establishment of matters of fact, the development of instrumental and methodological technologies, and the deployment of appropriate social strategies. There was more at stake however, than merely to be seen to be defending a true or objective set of beliefs and practices, and in particular it was crucial to possess the legitimate moral authority to articulate those beliefs and shape practices. The attitude that authorial legitimacy rested on a moral economy of trust and gentlemanly conventions has been rehearsed in the literature, notably by Steven Shapin in his *A Social History of Truth,* (1994).[1] However, legitimacy relied on more than civility, social or professional standing. Creditworthiness also relied on one's possession of a good reputation; indeed, one's good name was perhaps the best currency of the period.[2]

Personal credit and individual honour is a recurring theme in the literature of the Restoration. Thomas Hobbes had proclaimed "that when we believe any saying whatsoever it be, to be true, from arguments taken, not from the thing it self, or from the principles of natural Reason, but from the Authority, and good opinion we have, of him that hath sayd it; then is the speaker, or person we believe in, or trust in, and whose word we take, the object of our Faith; and the Honour done in believing, is done to him onely."[3] Robert Sanderson Bishop of Lincoln, similarly claimed "Wherefore particular things such as are facts of peculiar persons with their circumstances, which for the various changes, and contingencies whereunto they are obnoxious, are so mutable and doubtfull, that no certainty thereof can be had by way of demonstration, or other, except that which depends on the credit of men."[4] John Ray reported the same thing, rather more succinctly, in the proverb "He who but once a good name gets, may piss in bed and say he sweats."[5] The criteria for evaluating individual reputation clearly rested on an array of attributes influenced by fluid public judgments about honour, truth and integrity.[6]

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[1] Anna Bryson, *From Courtesy to Civility: Changing Codes of Conduct in Early Modern England* (Oxford: Clarendon Press, 1998); and Steven Shapin, *A Social History of Truth: Civility and Science in Seventeenth-Century England* (Chicago, University of Chicago Press, 1994). See also Frank Whigham, *Ambition and Privilege: The Social Tropes of Elizabethan Courtesy Literature* (Berkeley: University of California Press, 1984) esp. pp. 61-85.

[2] Craig Muldrew, *The Economy of Obligation: The Culture of Credit and Social Relations in Early Modern England* (London: Macmillan, 1998), pp. 121-196.

[3] Thomas Hobbes, 'Of the Ends, or Resolutions of Discourse', *Leviathan or the Matter, Form and Power of A Commonwealth Ecclesiastical and Civil (1651),* ed. C. B. Macpherson, Part 1, Chapter 7 (Hammersmith, New York, etc.: Penguin Books, 1978), p. 133.

Personal reputation would become critical in the debates between Morison and Ray about proper plant classification. The process of classification, by whatever definition, is a uniquely human activity in which categories, either implicit or explicit, are constructed to integrate commonly accepted knowledge. There is no absolute sense in which any classification system or set of organizing principles reflects the only 'true' or 'real' designation possible. Rather, classificatory categories incorporate the shared understanding of a society in terms of social organization, moral order and intellectual framework.[7] Taxonomy, then, derives from the social relations within a society itself, which justifies, legitimates and is persuaded by that taxonomy. Therefore, the scholarly discourse of Natural History was as reflective of competing social claims as of divergent philosophical principles of classification. In this circumstance, he who had the moral authority to articulate and win acceptance of any classification system, would be linked to a general perception of individual creditworthiness.

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[4] Robert Sanderson, *De Juramento. Seven Lectures concerning the Obligation of Promissory Oathes. Read Publickly in the Divinity School at Oxford. By Robert Sanderson, DD., His Majesties Public Professor there, Translated into England by his Late Majesties speciall command, and afterwards revised and approved under his Majesties own hand* (London, 1655), pp. 12-13.

[5] John Ray, *A collection of English Proverbs, digested into a convenient Method for the speedily finding any one upon occasion,* 2nd edn (Cambridge, 1678), p. 18.

[6] See especially A. J. Fletcher, 'Honour, Reputation and Local Officeholding in Elizabethan and Stuart England', *Order and Disorder in Early Modern England,* eds. Anthony Fletcher and John Stevenson (Cambridge: Cambridge University Press, 1985), pp. 92-115.

[7] Geoffrey C. Bowker and Susan Leigh Star, *Sorting Things Out: Classification and its Consequences* (Cambridge, MA and London, MIT Press, 1999).

Honour and Reputation

Robert Morison (1620-1683) was one of the foremost natural historians of the period, and possessed all the positive credentials we would expect of a 'scholar and a gentleman' in the cavalier culture of the period. Morison had been conspicuously loyal to the Crown during the Civil Wars, and in 1644 was wounded at the battle of Brig of Dee against the Covenanters. For the next sixteen years Morison lived among the community of Stuart loyalists in France, obtained a medical degree and supervised the royal gardens at Blois for Gaston, Duke of Orléans. At the Restoration in 1660, Morison returned to England as Physician to Charles II, was further rewarded by an appointment as Curator of the Royal Garden at St. James, and by 1669 also held a professorial chair at Oxford.[8] His early works included the *Praeludia Botanica* (London, 1669) dedicated to his patron the King, and the *Plantarum Umbelliferarum Distributio Nova* (Oxford, 1672) dedicated to the Duke of Ormond, Chancellor of the University of Oxford. Morison also edited and arranged publication of Paul Boccone's illustrated book of rare plants, the *Icones & Descriptiones Rariorum Plantarum* (Oxford 1674), which was financed by Morison's former student in Paris, Charles Hatton. Morison's *magnum opus* was the *Plantarum Historiae Universalis Oxonienses* (Oxford 1680), reputedly the largest investment of Bishop John Fell's University Press at the Sheldonian Theatre.[9]

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[8] Rio Howard, 'Medical politics and the founding of the Jardin des Plantes in Paris,' *Proceedings of the International Conference on the History of Museums and Collections in Natural History*, London, 3-6 April 1979 (London: Society for the Bibliography of Natural History, 1980), pp. 395-402; *Dictionary of National Biography*, vol. 13, pp. 958-960; S. H. Vines and G. C. Druce, *An Account of the Morisonian Herbarium* (Oxford: Clarendon Press, 1914), pp. xxiv-li; Sidney H . Vines, 'Robert Morison and John Ray', *The Makers of British Botany: A Collection of Biographies by Living Botanists*, ed. F. W. Oliver (Cambridge: Cambridge University Press, 1912) pp. 3-43; [Archibald Pitcairn], 'Vita Roberti Morisoni', *Historia Universalis Plantarum*, ed. Jacob Bobart (Oxford, 1699).

Morison's first work, the *Praeludia Botanica,* was in three parts: the *Hortus Regius Blesensis*, the *Hallucinationes Bauhini,* and the *Dialogus.*[10] The work was clearly Morison's declaration of erudition, learning, and social status, intended to establish his credentials as *Professore Botanico Regio* and as the legitimate spokesperson on botanical matters in contemporary England. The *Hortus* was an alphabetical catalogue of about 2600 plants from the Blois gardens of the Duke of Orleans, who was also an uncle to Charles II. For the aristocratic gardening enthusiasts, and according to the custom of the period, Morison was careful to emphasize novel inventions, and duly indicated all the previously undescribed species in the garden. Morison's designation of plants as annual or perennial was also seen as a valuable contribution to scholarship as well as gardening practice. Belated acknowledgement of his collaborators at the Blois gardens appeared perhaps as an afterthought, at the very end of the book.

The *Hallucinationes Bauhini,* dedicated to James Duke of York, was a strident criticism of the works of the respected Caspar Bauhin and his brother Jean. This of course was an excellent strategy for Morison to display the breath and depth of his own knowledge of European plants, but the consequence was to offend many natural historians who held the work of the Bauhins in high esteem. In 1720, a Morison apologist continued to justify "that now so much despis'd treatise," which was still "so much decry'd and enveigh'd against."[11] The famous eighteenth-century botanist Albrecht von Haller, FRS and member of the Royal Academy in Paris, had the last word on this treatise in 1771, describing it as an "invidiosum opus."[12]

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[9] Harry Carter, *A History of the Oxford University Press,* Vol. 1 to the year 1780 (Oxford, Clarendon Press, 1975), pp. 184, 237-238.

[10] Robert Morison, *Praeludia Botanica* (London, 1669).

The final treatise of the *Praeludia,* and the most contentious, was a hypothetical dialogue between Morison and a fellow of the Royal Society. The *Dialogus inter Socium Collegii Regii Londinensis, Gresham dicti, & Botanographum Regium*, also announced a brief sketch of Morison's own taxonomic method which he claimed to be well advanced. Morison's commentary was designed to declare his priority interest in plant classification as well as to discount John Ray's botanical credentials, a process he augmented with public, and false, declarations that "Mr. Ray studied Plants more in his Closet than in Gardens and Fields."[13] It is also likely that Morison viewed Ray as socially inferior and hence unworthy competition, and he interpreted Ray's early efforts at taxonomy as a challenge to his self-appointed role as the authoritative voice on plant matters. In 1720, Morison apologist and fellow Scot Patrick Blair criticized Ray precisely on the grounds of social standing, claiming that Ray's humble position made his rival botanical enterprise "a

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[11] Patrick Blair, *Botanick Essays* (London, 1720), p. 78.

[12] Albrecht Haller, *Bibliotheca Botanica qua scripta ad rem herbariam facientia* Vol. I (Tiguri, 1771), p. 543.

[13] Blair, *Botanick Essays*, pp. 99-100.

Piece of the greatest Boldness." Blair decried,

> Mr. Ray had by this time acquired a moderate skill in Botany, and had he applied himself to and kept up a Correspondence with Dr. Morison, who was in such a Station as it was no disparagement for him to do so, then they might have compared their Thoughts, and communicated to each other what they found convenient for the Advancement of that Science, by one and the same method . . . but when instead of that Mr. Ray would needs set up a Method of his own, in Opposition to the other, Dr. Morison or another in his Station, had reason enough to be angry with him for it.[14]

The immediate occasion of Morison's *Dialogus* was the set of plant tables prepared by Ray as part of John Wilkins' encyclopaedic *An Essay towards a Real Character and a Philosophical Language* (London, 1668). Wilkins, who was a founding member of the Royal Society and by 1668 Bishop of Chester, had dedicated the *Essay* to the President and Fellows of the Royal Society. Not only had the work itself been printed under Society auspices, but the *Essay* was regarded highly in Royal Society circles; in fact, a number of Fellows continued to work on the project after Wilkins' death in 1672.[15] This means that the interests and credibility not only of Ray and Wilkins but also of the Society more generally were at stake.

The practical justification for Wilkins' project was to provide a classification system for the collections in the repository of the Royal Society. Wilkins claimed that his system would not only organize the current holdings, but would illuminate the deficiencies in the collection. Wilkins proposed,

> Particularly in those Tables that concern the species of Natural Bodies; which, if they were (so far as they are yet known and discovered) distinctly reduced and described, This would

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[14] *Ibid.*, p. 91.

[15] Barbara Shapiro, *John Wilkins 1614-1672: An Intellectual Biography* (Berkeley and Los Angeles: University of California Press, 1969), pp. 220-223. Supporters for Wilkins' project within the Royal Society included John Aubrey, Christopher Wren, Samuel Pepys, Isaac Newton, William Wotton and John Wallis.

> very much promote and facilitate the knowledge of Nature, which is one great end of your Institution. And besides, the ranging of these things into such an order as the Society shall approve, would afford a very good method for your Repository, both for the disposal of what you have already, and the supply of what you want, towards the completing of that Collection . . . And by this means, I should not doubt, but that in a very short space, you would have the most useful Repository in the World. [16]

In fact, Wilkins' design was much more grand in scope, and a full discussion would require consideration of larger questions about the role of classification as *scientia* as well as the origins of human knowledge and the role of language in thought.[17] Wilkins' further and more modest ambitions included constructing a technical language to more precisely respond to the requirements of the new philosophy. He also intended the Universal Character to operate as an inclusive, catholic taxonomy into which "all kinde of Things, Notions and Words" in the world were to be ordered and classified according to a conventional linkage of 'things' and 'words'. Wilkins was proposing an artificial system with an arbitrary sorting criteria, whereby knowledge of things was associated with knowledge of their conventional names and their relative position within the classification hierarchy.[18] Ray's contribution to the project "for those most difficult Tables of Plants" was a relatively modest component of Wilkins' total construction.[19] Privately, Ray admitted that as a method for classifying plants, these tables were philosophically unsatisfactory, even "transparently absurd and imperfect,"[20] and that he had not been "free to follow nature, but forced to bow and strain things to serve a design according to the exigency of the Character."[21] Publicly, Ray cautioned readers about the artificiality of the classification "especially considering the straining and force that must sometimes be used, to make things comply with the institution of these tables into which they are reduced."[22]

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[16] John Wilkins, 'The Epistle Dedicatory,' *An Essay Towards a Real Character, and a Philosophical Language* (London, 1668), sig. a.

[17] Discussions of Wilkins' *Universal Character* may be placed into the much wider intellectual context of seventeenth century language theory. This includes notions that man's understanding involved a conventional linkage of 'things' with 'words' ("without reference to the Nature of things"), and that this linkage relied on the experience of the senses passed through language. See for instance, Slaughter, *Universal Languages and Scientific Taxonomy in the Seventeenth Century*(Cambridge: Cambridge University Press, 1984); Hans Aarslef, *From Locke to Saussure: Essays in the Study of Language and Intellectual History* (London: Athlone, 1982); Murray Cohen, *Sensible Words: Linguistic Practice in England 1640-1785* (Baltimore and London: Johns Hopkins University Press, 1977).

[18] Wilkins, *An Essay*, sig. b. If universally adopted, this conventional linkage of 'things' and 'words' would operate by "facilitating mutual Commerce, amongst the several nations of the World, and the improving of all Natural knowledge; it would likewise very much conduce to the spreading of the knowledge of Religion".

In 1669 Ray was an inconsequential member of the philosophical community in England. Although he had been elected a Fellow of the Royal Society in 1667, Ray's only work, the *Catalogus Cantabrigiam* (1660), had been published anonymously. In 1662, Ray had also left the relative security of Trinity College Cambridge to enjoy an unpredictable lifestyle as sometime client to Francis Willughby and John Wilkins. While Ray claimed "I value truth more than I value my reputation," in fact he was in no position to defend his own credit in a public debate with Morison. Ray's private sentiments were still unmistakable.

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[19] *Ibid.*, sig. c, pp. 67-121.

[20] John Ray to Martin Lister, 7 May 1669, *Correspondence of John Ray*, ed. Edwin Lankester (London: Ray Society, 1848; rpt. Arno Press 1975), p. 41. "*Pudet pigetque tabularum istarum botanicarum.*"

[21] John Ray to Martin Lister, 28 April 1670, *Correspondence of John Ray,* p. 55. Ray continued to discuss the restrictions placed by Wilkin's *Character* even as late as his *Methodus Emendata* (London, 1703), preface.

[22] Wilkins, *An Essay,* p. 67.

> Nevertheless, I despise that particular writer with good cause. Although he is so ill-equipped that he cannot even write decent Latin, he flatters himself in such bad taste and is so impenetrably conceited that he scorns men a thousand times more learned than himself and thinks himself unfairly treated because he has not been promoted long ago to a professorial chair. But as long as he sneers so fatuously at the Royal Society, he makes himself ridiculous to all sane and decent minded people.[23]

By 1670, Ray had begun to establish a rival identity as a legitimate spokesman for plant matters. He revived his publishing career with the first in a series of works on plants, the *Catalogus Angliae* (London, 1670). This was followed by the *Catalogus Stirpium* (London, 1673) and as well a catalogue of European plants was included with Ray's *Observations topographical, moral and physiological* (London, 1673). Also in 1673, Ray's 'Of the Specifick Differences of Plants', a paper concerned with identifying varietal forms among species, was read before the Royal Society.[24] In 1677, when Willughby's generosity had enabled Ray to be more socially and financially secure, Ray announced his own intentions for plant taxonomy in the second edition of the *Catalogus Angliae*.[25]

In contrast, Morison seems to have seen himself fully established as the authoritative voice on *res plantae*. In 1672, Morison's *Plantarum Umbelliferarum Distributio Nova*, was published at the Sheldonian Theatre in Oxford. Considered to be the first installment and introduction to Morison's complete taxonomic project, this work classified a single division of herbaceous plants. What is more important, Morison also declared his credentials to the learned world. He identified himself as *Authore Roberto Morison Medico & Professore Botanico Regio, necnon inclytae et celeberrimae Universitatis Oxoniensis P.B. ejusdemque Hort. Botanici Prafefecto primo,*[26] an advertisement of social and institutional affiliation which enumerated his qualifications for the project, but which were also entirely beyond Ray's ambitions.

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[23] John Ray to Martin Lister, 7 May 1669, *Correspondence of John Ray*, pp. 41-42, translated by Charles Raven, *John Ray Naturalist*, p. 184.

[24] Thomas Birch, *A History of the Royal Society for the Improving of Natural Knowledge*, vol. 3 (London 1756-1757, rpt. Hildescheim: George Olms Verlagbuchhandlung, 1968), pp. 169-173; meeting dated November 23, 1674.

[25] John Ray, 'Preface', *Catalogus Plantarum Angliae Insularum Adjacentium*, 2nd edn (London, 1677).

The *Plantarum Historiae Universalis Oxoniensis Pars Secunda* (1680), the second, and much larger installment of Morison's botanical project, considered a further segment of herbaceous plants.[27] Morison again identified himself as the authoritative *Medico & Professore Botanico Regio.* The work was a major publishing event, representing an enormous investment for the newly established University Press under the staunch cavalier Bishop of Oxford, John Fell, and there were high expectations that the *Historia* would be a major contribution to Anglican natural philosophy.[28] Further, part of the costs associated with producing the volume was raised by subscription, and "Noblemen, Gentlemen, and others" helped finance the engraving of new plates to illustrate the work. When it was completed, Morison's *Historia Universalis* was a lavish, richly illustrated and expensive piece of scholarship, intended for a gentle audience concerned with plants in particular, but with natural philosophy more generally.

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[26] Robert Morison, *Plantarum Umbelliferarum Distributio Nova per Tabulas Cognationes Et Affinitatis Ex Libro Naturo Observata & Detecta* (Oxford: Sheldonian Theatre, 1672). This classification of herbaceous plants is based on an efflorescence of many individual flowers carried on individual stalks and arising from a single stem, an arrangement which somewhat resembles an umbrella. Valerian, Yarrow and Queen's Anne Lace are examples of umbelliferous species.

[27] Robert Morison, *Plantarum Historiae Universalis Oxoniensis Pars Secunda seu Herbarum Distributio Nova per Tabulas Cognationis & Affinitatis ex Libro Naturae observata & detecta* (Oxford, 1680).

[28] Carter, *A History of the Oxford University Press,* I, pp. 184, 237-238

Morison worked within the accepted conventions of seventeenth-century scholarship and there are many resemblances to other botanical works of the period. The customary canon of authorities on *res herbaria* were invoked, including the English notables William Turner, John Gerard, Thomas Johnson and John Parkinson. Again following traditional herbal practice for enumerating plants, each entry carried a list of the synonymous names by which each plant had been known by earlier authorities and the ancients. Further, the descriptions generally included a "*locus & tempus*" and "*temperamentum & vires*" for each plant. Morison also continued his unpopular practice to list the "*hallucinationes Casp. Bauhini*" for each species.

In the *Historia Universalis,* Morison also followed the convention of recognizing individual contributions, although the overall number of citations was surprisingly few in comparison to similar natural histories. Several English plant specialists were identified by Morison as contributors, in particular individuals associated with several well-established gardens which were frequented by the larger community involved with plant matters. For instance, Morison acknowledged George London, the gardener for Henry Compton Bishop of London, Edward Morgan and his physic garden at Westminster, Jacob Bobart of the Physic Garden at Oxford University, James Watt of the Apothecaries Garden at Chelsea, as well as William Walker in connection with the royal gardens at St. James.[29] These individuals, however, do not constitute a community which was cultivated by Morison and thus became self-consciously involved in his specific enterprise. The pattern of acknowledgments in the *Historia Universalis* also suggests that Morison made no attempt to enlist members of Ray's community of plant specialists to participate in his project. Ray's own name was conspicuously absent from the English authorities, and there is only one direct reference to an observation made by Ray, a plant that was subsequently cultivated by Edward Morgan in his Westminster garden and later by Jacob Bobart in the Oxford Physic Garden.[30] The only allusion to any member of Ray's network concerned a rare plant from Thomas Lawson's garden reported by Thomas Willisel who had been an employee of Morison's during the 1660s, and by 1682 the plant was being grown in the Oxford Physic Garden.[31]

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[29] Morison, *Historiae Universalis,* pp. 47, 71, 94, 257, 308, 324, 367, 375, 420, 511, 583.

Several continental authorities were acknowledged, including observations from Paris made by Vespasiano Robin, the curator of the Jardin du Roi, and John Morin. Given Morison's tenure at the royal gardens at Blois, we may reasonably expect that he was personally acquainted with some if not all of the European scholars cited.[32] There were also a limited number of English associates who may be identified as having a direct involvement with Morison. An observation was attributed to Charles Hatton, his former Parisian student and financier of Paul Boccone's book of plants; Morison identified Hatton as *"vir generosus & Botanices pertissimus."*[33] Several observations were provided by

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[30] *Ibid.*, p. 152.

[31] *Ibid.*, p. 194

[32] *Ibid.*, pp. 98, 355.

[33] *Ibid.*, p. 84. Morison's mention of a plant found in the garden of Christopher Hatton "*Baronis de Hatton & Insulae Gernsay praedictae gubernatoris*", is most likely to highlight Morison's personal connections with the Hatton family. The attribution to Charles Hatton suggests a more active involvement in Morison's project.

Robert Huntington, a fellow of Merton College Oxford who sent Morison plants from Aleppo.[34] Robert Bannister, on whose behalf Morison had written to Henry Compton, subsequently sent plants from Virginia to Morison and Compton as well as to Ray.[35] Morison also received seeds from Alexander Balam, known to have sent specimens to Gaston Duke of Orleans, and most likely had become acquainted with Morison during his tenure at the Blois Garden.[36] The surgeon Robert Spottiswood sent seeds from Tangier, and is singularly identified in the *Historia Universalis* as a 'friend'.[37] Morison may also have known George Wheeler whose published account of his travels in Greece did not appear until 1682.[38] In sum, Morison acknowledged contributions from six individuals, of whom only Wheeler and Hatton can with certainty be located in England during the 1680s and thus be considered potential allies and an expert community in Morison's circle.

Morison may have anticipated that his project would appeal to an audience of wealth and privilege within Restoration society rather than to a specialized readership of knowledgeable natural historians. Indeed, the proposal for subscription to the *Historia Plantarum Universalis* was addressed to "Noblemen and Gentlemen, as are desirous to further encourage this Great Work." Morison promised that "every Nobleman and Gentleman, or other, who will be pleased to favour him with one plate of Five Pounds, that an Honourable Memorial shall be made of him, by Engraving his Coat of Arms on their respective plates."[39] Thus, the subscribers to Morison's *Historia Plantarum Universalis* were recognized not by inclusion in a mere list of names, but with their contributions memoralized by honorific title and coat of arms emblazoned on each plate.[40] The names of subscribers appeared in order of precedence and included aristocrats, bishops, office holders and landed gentry, physicians, apothecaries as well as John Rose, gardener to Charles II (Plate 122). While it was not unusual for quality to be indicated in contemporary subscription lists, the majority of such lists appeared in alphabetical order, although authors may have followed a rough order of precedence within each letter.[41] What is unusual about Morison's practice is that subscribers were acknowledged entirely according to rank, and further the social status of each individual was explicitly linked to ideas of the nobility of the corresponding plant.[42] Plate one, for instance, illustrated the first classification, the *Bacciferis & Scandentibus*, a grouping which included asparagus and clematis, and which was implicitly understood to be more or less 'noble' for the ability of these plants to grow vertically. The engraving was dedicated to Prince Rupert, *Dei gratia Comitis Palatini Rheni, Ducis Bavariae & Cumbriae totius Angliae Vice Admirallis & Castre Regalis Vindsor Constabulariis & Gubernaturis, etc.* Plate two, which represented a further grouping of similar plants, recognized James, Duke of York, *Auspiciis Illustrissimi Principis Jacobi Ducis Montumelensis & Baccleurchensis, Comitis de Doncaster & Dalkeith, Regni Scotiae magni Camerarii, Universitatis Cantabrigiensis Cancellarii, Cmo. Carlo secundo equitum Magistri & Nobilissimi Ordinis Periscelidis Equitis.* The last plate in the volume (Plate 123), engraved under the auspices of the apothecary Thomas Thomas, illustrated plants from the genus *Polygonum,* a humble herbaceous groundcover.

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[34] *Ibid.*, pp. 123, 131, 312, 314, 495, 524, 541, 592. Huntingdon would later contribute to Ray's *Historia Plantarum* and in 1699, Hans Sloane unsuccessfully nominated Huntingdon to the Royal Society .

[35] Morison, *Plantarum Universalis*, p. 528. Banister later sent plants to John Ray and to Henry Compton, Bishop of London; Joseph and Nesta Ewan, *John Banister and his Natural History of Virginia 1678-1692* (Urbana, Chicago, London: University of Illinois Press, 1970), pp. 31-35.

[36] *Ibid.*, pp. 145, 583; James Britten, *The Sloane Herbarium: an annotated list of the Horti Sicci composing it*, rev. and ed. J. E. Dandy (London: British Museum, 1958), p. 84. Balam had sent seeds from Tuscany to Gaston, Duke of Orleans in 1656 and was also cited as a contributor by Christopher Merrett. Ray cited Balam in the *Catalogus Angliae* (1670) pp. 305-306.

[37] Morison, *Historia Universalis*, pp. 18, 14, 19, 57; Britten, *The Sloane Herbarium*, p. 84. Spottiswood was also an acquaintance of Balam's.

[38] Morison, *Plantarum Universalis*, p. 182; Wheeler was the author of *A journey into Greece by George Wheeler Esq.* (London 1682); James Britten and George S. Boulger, *A Biographical Index of Deceased British and Irish Botanists* (London: Taylor and Jarvis 1893, rev. 1931), p. 323.

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[39] *The Proposal to Noblemen, Gentlemen, and others, who are willing to Subscribe towards Dr. Morison's New Universal Herbal, ordering Plants, according to a new and true Method never mentioend heretofore.*

[40] Morison designated subscribers' names on individual engravings rather than printing them separately in a subscription list. We may assume that this recognition served, in part, as an incentive for some individuals to subscribe to the work. One of the reasons for the success of any publication sold by subscription may have been the printed list of subscribers who were eager to have their names in print; F. J. G. Robinson and P. J. Wallis, *Book Subscription Lists, a Revised Guide* (Newcastle Upon Tyne: Book Subscription List Project, 1975), pp. III.

[41] *Ibid.* p. vi.

Morison's practice to list subscribers in order of precedence may be compared to another contemporary work published by subscription, also printed at the Sheldonian Theatre at Oxford University, and further emphasizes the appeal to wealth and privilege implicit in the *Historia Universalis*. Francis Willughby's *Historia Piscium* (Oxford, 1686), edited by John Ray, was published in collaboration with the Royal Society which also had a financial interest in the project.[43] This work also attached subscribers' names to individual illustrations. However, there is no apparent organization, alphabetical or otherwise, to the names of subscribers, although the support of many individual Fellows of the Royal Society is a conspicuous feature.[44]

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[42] Allen J. Grieco, 'The Social Order of Nature and the Natural Order of Society in Late 13th - Early 14th century Italy' *Miscellanea Medievallia* (1992), pp. 898; Grieco, 'The Social Politics of Pre-Linnean Classification', *I Tatti Studies* 4 (1991), pp. 131-149.

[43] R. K. Bluhm, 'Remarks on the Royal Society's Finances, 1660-1768', *Notes and Records of the Royal Society* 13 (1958), pp. 82-103.

Published subscribers' lists commonly indicated individual affiliation in recognized societies.[45] In the *Historia Universalis,* Morison duly declared the credentials of physicians and apothecaries as Fellows of the London College of Physicians or the Apothecaries Society. Morison however, disregarded this common practice with respect to the Royal Society, and omitted affiliation of such prominent and well-known Fellows such as Robert Boyle (Plate 15), Robert Southwell (Plate 26) and Christopher Wren (Plage 43). The Royal Society, of course, also cherished an ambition to present itself as the legitimate authority to speak on all matters of natural knowledge. When Morison's claims were late contested by John Ray, it was done with the Society's endorsement.

The *Plantarum Historiae Universalis Oxoniensis Pars Secunda* enunciated a taxonomic system for a limited selection of herbaceous plants, but Morison did not fully articulate all the philosophical principles for an entire plant classification scheme. The taxonomy, as presented in the *Historia Universalis,* ranked only five groupings of herbaceous plants according to their 'essential character'.[46] Morison's self-professed method was to "select the identity of plants from tables of relationship or affinity according to the similitude of flowers, seed capsules and seeds."[47] Morison further claimed that his classification was an entirely original invention, and a method discovered directly from his own observations of nature, "*ex Libro Naturae Observata & Detecta.*" He interpreted his own role as merely one to reveal a hitherto hidden ancient truth about the order of nature. Morison insisted, "the Method is now given by Nature, and by me alone (without Vanity) only observed, discovered by none but myself, although it be of an equal date with the beginning of the world."[48]

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[44] Francis Willughby, *Historia Piscium* (Oxford: Sheldonian Theatre, 1686).

[45] *Ibid.*

[46] Vines and Druce, 'Robert Morison and John Ray', pp. 22-23.

In 1680, the philosophical passion for a systematic arrangement of nature was still in its adolescence. In the sixteenth century, Conrad Gessner had begun a project to classify plants, but his efforts remained unpublished until the eighteenth century. Earlier in the seventeenth century, Caspar Bauhin had also arranged plants according to their similarities and differences, an attempt which was carefully examined and harshly censured by Morison. However, during the course of the seventeenth century, the classificatory principles of Andreas Cesalpino, either implicit or explicit, underlay virtually all other attempts at plant taxonomy. Cesalpino (1519-1603), professor of medicine and botany at the University of Pisa and later physician to Pope Clement VIII, had undertaken a project to revive Aristotle's classification of nature. Aristotelian metaphysics held that all things were composed of both matter and a natural essence or form, and that true knowledge of a thing involved knowledge of its essence. This philosophy, mediated by scholastic refinements, also held that each species is distinguished by an essence which specifies its identity according to rigidly determined features. A major philosophical difficulty was to specify which structure or characteristic unambiguously denoted a thing's essence. Without true knowledge of the essence, proper philosophical classification was unattainable. In the sixteenth century, Cesalpino concluded *a priori*, that the physical structures of fructification, as a manifestation of the vegetative soul, demonstrated the plant's true essence. The *De plantis Libri XVI* (Florence, 1583) enunciated Cesalpino's philosophically justified and logically consistent method in which variations in the seed structures were used as criteria for classification.[49] Morison similarly emphasized seed structure as the primary classification criteria for his system. For instance, in the *Plantarum Umbelliferarum*, a natural grouping of plants based on flower structure, the systematic arrangements of plants within the family is based exclusively on the external form of the seed.[50]

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[47] Robert Morison to Martin Vogel, early January 1669/70 (Letter 1373a), *Correspondence of Henry Oldenburg*, ed. A. Rupert Hall and Marie Boas Hall, Vol. VI (Madison: University of Wisconsin Press, 1969), pp. 442-443.

[48] Robert Morison, 'Epistle Dedicatory,' *Hortus Blesensis*, *Quin & methodum mean novam a natura data a me solummodo (citra jactantiam) observatam a nullo nisi meisop in hunc usque detectam quam vis mundi incumabilis sit coaeva.*" p.2, Translation by Patrick Blair, *Botanick Essays*, p. 79.

Morison may have believed that his taxonomy represented an original, new and different method which was a fundamental departure from earlier attempts at classification.[51] However, the rhetoric in his *Historia Universalis* did not obscure the resemblance of his classification criteria to the earlier scheme by Cesalpino. Indeed, the similarity between the two systems had earlier aroused comment within the Royal Society. In 1670, based on the sketch provided in Morison's *Praeludia Botanica,* Martin Vogel had written to the secretary of the Society, Henry Oldenburg, "but this I do blame [Morison] for, that he makes the initial difference between plants depend upon the flowers (if I remember rightly), or that he begins the scheme of the differences with the flowers. In just the same way I blame Cesalpino because he makes the same scheme begin with the seeds."[52]

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[49] Julius von Sachs, *History of Botany (1530-1860)*, Henry E. F. Garnsey and Isaac Bayley Balfour, trans. and rev.; second impression (Oxford: Clarendon Press, 1906), pp. 37-58.

[50] Morison, *Plantarum Umbelliferarum;* Sachs, *History of Botany*, pp. 66-68.

[51] Linnaeus also classified on the basis of reproductive structures, and he interpreted Morison's efforts as departing significantly from Cesalpinian principles; see Sachs, *History of Botany*, p. 66.

During the course of the seventeenth century, scholars were becoming more sensitive to issues of intellectual property and the proper attribution of credit. The Royal Society especially had been dedicated to the polite management of philosophical disputes, including disputes to protect authorship itself, and had established a set of conventional rules to govern claims to priority. Henry Oldenburg, for instance, assured Robert Boyle "the Society, being very careful of registering as well the person and time of any new matter, imparted to them, as the matter itself; whereby the honour of the invention will be inviolably preserved to all posterity."[53] While the Royal Society may have underestimated the complexity of the process and was at best only partially successful in satisfying the authors of such claims, nevertheless it still attempted to adjudicate disputes and safeguard the priority rights of its Fellows.[54] The scope of their ambitions in this area included both proper credit for mechanical inventions and proper attribution of less tangible but no less significant philosophical ideas.

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[52] Martin Vogel to Oldenburg, 27 November 1669 (Letter 1330), *Correspondence of Henry Oldenburg,* VI, pp. 342-348; "In my opinion that man who lately argues (in his notes on the garden at Blois) for deriving the chief distinction among plants from the flowers and tries in this way to reform Bauhin's Pinax, goes far astray."

[53] Oldenburg to Robert Boyle, 24 November 1664, *Correspondence of Henry Oldenburg,* pp. 319.

One of the early cases of priority and credit upon which the Royal Society was called to mediate involved John Ray, who therefore had reason to be especially sensitive about such matters. In the late 1660s two members of his network, Martin Lister and Edward Hulse, independently observed and reported on the capacity of spiders for 'casting their threads'. In 1669, Lister wrote to Ray describing a "first discovery, I made the like Observation in almost all sorts of Spiders, I had before distinguished; and I found the Air filled with young and old [spiders] sailing on their threads, and undoubtedly seizing Gnats and other Insects in their passage." Ray duly forwarded the letter to the Royal Society, "from Cambridge by an ingenious person who for the present desires to have his name concealed,"[55] which Oldenburg published in the *Philosophical Transactions*, identifying Lister only as an "Ingenious Cantabrigiam."[56] Shortly thereafter Ray worried to Lister that he had undeservedly received credit for the observations because of its publication under Ray's auspices. "One thing I must not to omit to tell you" wrote Ray, "that I have robb'd you of the Credit those observations you communicated to the Society have gained in Foreign Parts, by letting my Name stand before them, and suffering yours to be suppressed; for I hear that they are attributed to me."[57]

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[54] Robert Iliffe, '"In the Warehouse": Privacy, Property and priority in the early Royal Society', *History of Science* 30 (1992), pp. 29-68.

[55] Philip Skippon to Henry Oldenburg, 16 February 1669 (Letter 1113), *Correspondence of Henry Oldenburg*, V, pp. 409-410; Birch, *History of the Royal Society*, II, p. 348, 18 February 1668/69.

[56] Martin Lister to John Ray probable date January 1669 and read at the meeting of the Royal Society 18 February 1669. Published as 'Some observations concerning the odd turn of some shell-snails and the darting of spiders', *Philosophical Transactions* No. 50, 16 August 1670, pp. 1011-16.

A mistaken attribution of credit, however was the least in a cascade of events which involved a painful public admission by Ray that Lister's letter had not been his first knowledge of the phenomena. Another Cantabrigian, Edward Hulse, had also communicated to Ray his observations of flying spiders, and Ray subsequently forwarded Hulse's account to the Royal Society as well. Oldenburg, well rehearsed in the bitter battles which proper assignment of credit could provoke, properly raised the relevant questions about priority.[58] As manager of the dispute, Oldenburg eventually publicized the issue in the *Philosophical Transactions.* Hulse's detailed report of his observations was printed, accompanied by an apologetic admission from Ray. "Concerning the manner of Spiders projecting their threads" Ray recounted, "I received the following account from Dr. Hulse, from whom (to do him right) I must acknowledge, I had the first notice of this particular, which was not long after communicated to me by another Ingenious Friend, whose Letter I formerly sent you to be imparted to the Royal Society."[59] Closure to the debate was imposed by Oldenburg, who assigned credit in a manner worthy of King Solomon himself, to all three participants.

> Whence it appears, that this Observation is as well Mr. Listers, as Dr. Hulse's (as it also acknowledged in the beginning of the precedent Account;) though it be true also, that when it was written and sent by the former of those two Gentlemen, it was not then a thing

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[57] John Ray to Martin Lister, 10 December 1669, *Correspondence of John Ray*, p. 54.

[58] Francis Willughby to Henry Oldenburg, 4 July 1670 (Letter 1479), *Correspondence of Henry Oldenburg*, VI, pp. 53-54; see, Iliffe, 'In the Warehouse' for other instances of priority disputes.

[59] *Philosophical Transactions*, No. 65, 14 November 1670, p. 2103.

> altogether unknown to Mr. Wray, but confirmed and enlarged by Mr. Lister's own Observations. Which was thought fit to add here, that nothing might be detracted from Mr. Lister for permitting his Notes in the lately mention'd Tract to be published as his own, which really they are.[60]

Oldenburg's account of the event could only have been highly embarrassing to Ray, whose actions as a broker between his correspondents and the Royal Society were held up to public scrutiny. Privately as well, Ray suffered that the affair would damage his relationship with Lister. He wrote, "Let me not lose your Love and Friendship, which I do very highly prize; and therefore should be loth to do or say anything which might give you any Displeasure, or alienate your Mind from me, or in any Measure abate and cool that Affection and good Will which you have professed to me."[61] In the future, Ray would be meticulous in observing every propriety governing individual recognition, and would insist that "the glory of the [first] invention is of right due to him, who first communicated it to the world."[62] It also became commonplace for Ray to assure his corespondents that "I shall be careful to doe you right, and not rob you of any part of that honour that is due you from the curious and ingenious."[63] Indeed, Ray would become recognized for the "unreserved and abundant commendation" which his friends received for all their contributions to the natural history project of the seventeenth century.

Private discourse between gentlemen therefore carried a special responsibility in matters of authorship and attribution. During the Restoration the practice of unacknowledged borrowing from unnamed sources also warranted disapproval. In *Francis Willughby's Ornithology* (London, 1676), Ray advertised the impropriety of plagiarism and severely censured those who knowingly practised the deceit.

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[60] *Ibid.*

[61] John Ray to Martin Lister, 17 July 1670, *Correspondence of John Ray*, pp. 61-63.

[62] John Ray, *The Ornithology of Francis Willughby of Middleton in the County of Warwick Esq, Fellow of the Royal Society* (London, 1676), p. 8.

[63] John Ray to Edward Lhwyd, 21 June, 1689, *Further Correspondence of John Ray*, p. 188.

> Here by the by I cannot but reflect upon the Author of a late English Book, entituled, The Gentleman's Recreation. For having had occasion to examine and compare Books upon these Subjects, I find that all he hath considerable concerning Fowling is taken out of the forementioned Book of Markham; and yet hath he not to my remembrance made any mention of this Author: What he hath of Hawking is likewise an Epitome of Tubervilles Collections, with some addition out of Lathams Falconry, without acknowledgement that all was borrowed. I doubt not but I could have traced him in his other Discourses of Hunting and Fishing, had I leisure or will to compare his Book with Tubervilles, Waltons, and other Treatises of those subjects. I do not blame him for Epitomizing, but for suppressing his Authors names, and publishing their Works as his own, insomuch that not only the Vulgar, but even Learned men have been deceived by him, so that they have looked upon him as a considerable Writer, of extraordinary skill in such Arts and exercises, and one that had advanced and approved them. By the way therefore it may not be amiss to caution Learned men that they be not too hasty nor lavish in their publick commendations of new Books before they have taken the pains to compare them with former Treatises on those Subjects, lest they render themselves ridiculous by publishing those for advancers of knowledge who are indeed meer Plagiaries and Compilers of other mens Works.[64]

In light of the Royal Society's commitment to the proper assignment of credit, and Ray's own lesson in the matter, the issue of Morison's intellectual debt to Cesalpino could not pass unchallenged. The evidence is unclear whether the principal response to Morison was launched by rival interests at the Society or whether the rejoinder was initiated by Ray personally. In any event, in 1682, Ray published his initial proposal for a plant taxonomy, the *Methodus plantarum nova brevitatis*, which was printed by the official Royal Society printers. A measure of the loss of credit that Morison may have experienced is evident in Ray's dedication to Morison's former patron Charles Hatton, who had not been within

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[64] Ray, 'The Preface', *The Ornithology of Francis Willughby*, sig (a2).

Ray's circle of natural historians during the 1670s.[65] Ray, of course, was careful to acknowledge all intellectual debts, and it is no surprise to find Andreas Cesalpino, Joachim Jung, but also Morison cited for their diligence in the accurate observation of nature. However, as an addendum to the *Methodus*, Ray included a synopsis of Cesalpino's classification method. Although Ray himself avoided making an explicit charge of plagiary, it was nevertheless apparent that Morison could have 'borrowed' his principles not from nature at all but from a well-regarded, recognized authority on plants. Despite Ray's reserve, on the continent Morison was condemned outright for plagiarism. In 1694, the foremost French botanist, curator of the Jardin du Roi and member of the French Academy, Joseph Pitton de Tournefort, who otherwise found many of Morison's classificatory principles congenial, commented,

> One does not know to praise this author sufficiently; but he seems to praise himself over much . . . he dares to compare his discoveries to those of Christopher Columbus . . . and without mentioning Ges[s]ner, Cesalpin[o] or Columna, he states in several passages in his writing that he has taken nothing except direct from nature. One might, perhaps, believe this if he had not taken the trouble to copy whole pages from the two authors last named, showing that their works were familiar enough to him.[66]

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[65] John Ray, *Joannis Raii de variis plantarum methodis dissertio brevis in qua agitur* (London, 1682). Ray's monumental *Historia Plantarum* was also dedicated to Hatton. It is not unreasonable to expect that Hatton was the 'friend' who had urged Ray to proceed with this project. Ray's former patrons John Wilkins and Francis Willughby were dead, and Ray wrote to Hans Sloane in February 1684, that he had undertaken the project "to satisfy the importunity of some friends who solicited me to undertake it", unnecessary if Sloane had been implicated in the encouragement. *Correspondence*, p. 139 and reprinted p. 160.

[66] Tournefort's *Elements de Botanique* (1694), p. 19 from *DNB* Vol. 13, p. 959.; also quoted in Vines and Druce, 'Robert Morison and John Ray', p. 27. Archibald Pitcairn included part of Tournefort's comments in his 'Vita' of Morison. "*Adiamus hic varios insignes Botanicos, & in primis clarissimum illum Tornefortium. 'Nisi', inquit, 'accessisset ad rem Botanicam illustrandam Robertus Morisonnius, Jaceret ea hodie Cimmeriis tenebris damnata.' Addit tamen haec, 'Non satis. laudari posset Morisonus, nisi si ipse nimium laudasset, quippe non satis gloriosum ducens operis omnium in Botanica pulcherrimi partem exegisse, cum Columbo se confert Orbis novi repertore, nulla etiam facta mentione Gesneri aut Caesalpini, Columnaeque.*'" *Historia Universalis* (1699), sig. bv.

We have no evidence of the shape of Morison's response to Ray's challenge, if there was one, and the controversy was brought to a close with Morison's accidental death in 1683. However, Morison's lack of supporters certainly facilitated the success of rival interests at the Royal Society to redefine the activity of Natural History in the late seventeenth century. Ray's own *opus major*, the *Historia Plantarum* (1686, 1688 and 1704), which identified and classified 18,000 plants according to his own system, was produced by the Royal Society and again dedicated to Morison's former patron, Charles Hatton. In addition Ray was careful to acknowledge the by-now sizeable community of plant enthusiasts who had contributed to the undertaking since 1660. The primary result of Ray's generous and frequently extravagant praise for his collaborators was to virtually guarantee the allegiance of a large community of botanists. Also, from the 1680s, Ray enjoyed unqualified support from the Royal Society, especially during the tenure of Hans Sloane as Secretary. A final measure of Ray's ultimate success is manifest in the last work attributed to Morison. Part III of Morison's *Historia Universalis* was printed by the Sheldonian Press in 1699 and edited by Ray's friend and collaborator, Jacob Bobart Jr., of the Oxford Physic Garden. Not only did Bobart incorporate many of Ray's classification principles, but he also identified himself with the botanical community established and encouraged over four decades by John Ray.

Nature Ordered

> To make exact philosophical tables, you know, is a matter very difficult, not to say impossible; to make such as are tolerable requires much diligence and experience, and is work enough for one man's whole life.[67]

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[67] Ray to Martin Lister, 28 April 1670, *The Correspondence of John Ray*, p. 55.

During the formative years of the Royal Society, classification, as an activity for acquiring new knowledge of nature, had not been the first priority among the Fellows. John Wilkins' project for a universal taxonomy, his *Essay Towards a Real Character and a Philosophical Language* (London, 1668), was a notable attempt to engage in this aspect of natural philosophy. Nevertheless, Thomas Sprat had designated the classification of nature as the highest perfection of man's reason.

> There is nothing of all the works of Nature, so inconsiderable, so remote, or so fully known; but, by being made to reflect on other things, it will at once enlighten them, and shew it self the clearer. Such is the dependance amongst all the orders of creatures; the inanimate, the sensitive, the rational, the natural, the artificial: that the apprehension of one of them, is a good step towards the understanding of the rest: And this is the highest pitch of *human reason*; to follow all the links of this chain, till all their secrets are open to our minds; and their works advanc'd, or imitated by our hands. This is truly to command the world; to rank all the *varieties*, and *degrees* of things, so orderly one upon another; that standing on the top of them, we may perfectly behold all that are below, and make them all serviceable to the quiet, and peace, and plenty of Man's life. Add to this happiness, there can be nothing else added: but that we make a second advantage of this *rising ground*, thereby to look the nearer into heaven: An ambition, which though it was punish'd in the *old World*, by an *universal Confusion*; when it was manag'd with *impiety* and *insolence*: yet when it is carried on by that *humility* and *innocence*, which can never be separated from true knowledge; when it is design'd not to *brave* the Creator of all things, but to *admire* him the more: it must needs be the utmost perfection of *human Nature*. [68]

During the 1670s, as we have seen, natural historians began to develop an urgent concern with issues of plant taxonomy, although Ray himself frequently expressed his reluctance to undertake the enormous project of classifying nature. Even as late as 1684, he continued to claim such an enterprise to "be out of my way, and belong not to my profession."[69] However, among Ray's earliest surviving correspondence, and long before embarking on any project to classify plants, he had advised Francis Willughby on the arrangement of a cabinet to store botanical specimens. Already adept in the pragmatic identification of different species of plants, and well aware of the practical difficulties involved, Ray's advice in 1661 was clear. Plants that physically resembled each other should be arranged in close proximity; indeed, "concerning the order and method of [classifying] you need not my advice, for I can give you none but what is very obvious, viz., to put those of the same tribe near together."[70] If it seemed entirely obvious to Ray in 1661 that plants that looked similar should be grouped together, it was no less obvious in 1680 after publication of Morison's *Historia Universalis.*[71]

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[68] Sprat, *History of the Royal Society*, p. 110.

[69] Ray to Tancred Robinson, dated 16 June 1684, *The Correspondence of John Ray*, p. 146.

As Ray saw it, there were two problems with Cesalpino's Aristotelian method and hence also with Morison's. Classification within this tradition had proceeded on the basis of division by a single, essential character.[72] Taxonomies based on a set of limited and predetermined physical characteristics not only produced results where unrelated species predetermined physical characteristics not only produced results where unrelated species were grouped together, but also that separated related species. Ray was explicit in his criticism,

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[70] Letter to Willughby, 14 September 1662, *Correspondence*, p. 4.

[71] Biological classification is possible because of a universal human ability to recognize and categorize groups of livings beings that are similar to one another in varying degrees in their overall morphological structure, or morphological plan. This commonsense notion that nature possesses recognizable regularities provides the rational explanation for "the observed structural and substantive typological regularities found among systems of enthnobiological classification of traditional peoples from many different parts of the world". See for instance Brent Berlin, *Ethnobiological Classification: Principles of Categorization of Plants and Animals in Traditional Societies* (Princeton: Princeton University Press, 1992) and Cecil H. Brown. *Languages and Living Things: Uniformities in Folk Classification and Naming* (New Brunswick, New Jersey: Rutgers University Press, 1984). Berlin suggests the 'biological reality' that nature exists in "perceptually distinctive chunks" is an especially "powerful notion intuitively understood by every field biologist and practising taxonomist," p. 60. Scot Atran studied early modern classification systems from a cultural anthropological perspective and explicitly situates Ray and as well as other seventeenth century taxonomists within the folk classification tradition; see Atran, *Cognitive foundations of natural history.*

[72] Although Aristotle himself recognized the limitations of dichotomous division for the classification of biological organisms, and in fact rejected logical classification in favour of a complex of non-essential characters in his zoological schemes nevertheless Aristotle's followers in general divided species on the basis on a single, essential character. See for instance G. E. R. Lloyd, 'The Development of Zoological Taxonomy', *Science, Folklore and Ideology* (Cambridge University Press, 1983), and Slaughter, *Universal Languages and Scientific Taxonomy*, pp. 1- 37.

> [Cesalpino's method] tears apart and separates what are of the same family and kindred; and equally couples and associates those of diverse. Thus for example it rends asunder and disjoins from one another the *Legumes*, which possess a certain and eminent characteristic note of the genus, namely a *butterfly-like flower*. For there are in this genus those which bear solitary seeds beneath single flowers . . . There are those with paired seed conceptacles with many seeds in individual sacs . . . Add to this, that the figures of flowers and of their parts and accidents of no few genera exhibit certain and characteristic notes, the species of which agree neither in the number of seeds, nor in [that of] receptacles, as we have shown.[73]

Ray's response to Morison, the *Methodus Plantarum Nova* (1682), set out the basic principles that would govern his future attempts at plant classification and which also became the agreed-upon criteria within Ray's expert community. Ray sought to identify species according to their maximum natural affinities; that is, members of any given group of plants showing a high degree of similarity in physical characteristics with another group would be assumed to be related.[74] As Ray himself explained the matter, he grouped species according to the "characteristic notes of each kind." When such notes were absent, identification was made by "at least a collection of many accidents, which all together could not be found in any species else of the same kind."[75] Where 'accidents' were used by Ray as a feature to identify a species, he understood the term in its Aristotelian sense as the apparent attributes or properties that may be present or absent in a material body and which are experienced by the senses, but which did not constitute its real essence.[76] What Ray was trying to achieve in his 'humbly empirical' classification system was to establish natural history as a proper 'science of the senses', rather than as a servant to philosophical dictates Ray's method therefore, arranged plants not in terms of 'essences' or 'forms' but according to "the similarity and agreement of the principal parts," and especially those parts that were present in all plants.[77] He explained his method of identification:

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[73] Ray, *Methodus plantarum nova, brevitatis & perspicuitatis causa synoptice in tabulis exhibita,* (London, 1682), trans. A. J. Cain, 'John Ray on 'Accidents', *Archives of Natural History* 23 (1996) pp. 343-368.

[74] The issue here is to identify rather than to define species. Note also that Ray understood species as individuals having a common parentage, that is he defined species in terms of their biological relationship. Therefore to call species 'related' or 'kindred' was fully consistent with Ray's usage. Ray, 'Of the specific Differences of Plants', A. J. Cain, 'John Ray on the Species', *Archives of Natural History* 26(2), (1999), pp. 223-231, Ernst Mayr, *The Growth of Biological Thought* (Cambridge, MA: The Belknap Press of Harvard University, 1982), pp. 256-257.

[75] Ray, 'The Preface' *Willughby's Ornithology*, p. 3.

> But since I had set myself to find out for the constituting of Genera definite and particular characteristic notes which would agree in all the species contained in whatever genus, and in those only, I thought fit not to consult the seed only and the conceptacles of them, but to take into council the flowers also and perianths, which apply to some genera more certain notes than either the seeds or their envelopes. Partly therefore, we have taken the constitutive Differences of genera from the number, figure, site &c. of the seeds and seminal conceptacles, Partly from the Flower and perianth agreeing in the same and other accidents, not neglecting from time to time the siting of the leaves on the stem, the which how much used on occasion, appears from the distinction of the Verticillates from those called Asperifolians.[78]

Well aware that there were many possible ways of placing plants into groups, he proposed a pragmatic method which considered an array of physical characteristics. He believed that experience was the only guide to recognize the natural groupings of plants as well as animals, birds, fish and insects. He repeatedly rejected Aristotelian qualities and essences; if indeed there were such, as they could not be known by experience.

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[76] A. J. Cain, 'John Ray on Accidents', *Archives of Natural History* 23(3) (1996), pp. 345-353.

[77] Admittedly, it may be possible to interpret isolated fragments of Ray's writings which suggest an 'essentialist' understanding of classification and especially where he justified his methods against other attempts to define classes rigorously by one sort of characteristic only ; see Sloane, 'John Locke, John Ray and the problem of the natural system'. However, examination of both Ray's theory and practice over his entire career strongly suggests that he used the practical, pragmatic approach of a field biologist to problems of plant identification and classification for "perceptually distinctive chunks" of nature; see especially Cain, 'John Ray on Accidents', and Mayr, *The Growth of Biological Thought*, pp. 162-163.

[78] *Ibid.*

> The Essences of things are directly unknown to us. For since all our knowledge takes its origin from sense, nor do we know anything of the things which are outside of us, but that they have the faculty of affecting our senses in this or that manner and by the mediation of these impressions, exerting such or such images in the Intellect; if the essences of things are immaterial forms, it is allowed by all that in no way do they come to meet our senses: If indeed they are nothing other than some certain proportion and mixture of natural Principles or minima; since those minima can be perceived separately by no sense of ours, however much armed or assisted. Certainly it must be that the figure or proportion of them escapes our senses and lies hidden . . . Since therefore the essences of things are unknown to us, the essential notes of genera can certainly not be known by us. However it is most probable that those [plants] which agree in very many attributes agree in the same nature.[79]

In attempting to establish proper criteria to classify living nature, Ray was doing no more (and no less) than many other natural philosophers of the late seventeenth century. Ray, for instance, was well acquainted with the position advanced in Robert Boyle's *The Origins of Forms and Qualities according to the Corpuscular Philosophy* (1666),[80] which had attempted to redefine the classificatory criteria for inanimate bodies. Boyle, also, had rejected Aristotelian essences as unknowable, and favoured the use of an array of physical attributes which could be known by the senses. These characteristics by 'being so and so disposed', associated with particular sorts of bodies and observable by the senses, constituted the "conspicuous accidents [which] are associated in some bodies so that men have agreed to distinguish them into several sorts, which they call genders or species."[81] Boyle also agreed that species could not be distinguished on the basis of one such conspicuous accident; rather an "aggregate or convention of such accidents" was necessary to properly discriminate between groups, "since to every determinate species of bodies there doth belong more than one quality, and for the most part a concurrence of many is so essential to that sort of bodies that the want of any of them is sufficient to exclude it from belonging to that species."[82]

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[79] John Ray, *Brief Dissertation of the Various Methods of Plants* (London: 1704), p. 5, unpublished manuscript of Ray's *Methodus Emendata,* translated A. J. Cain. The title page inaccurately signifies that the work was published in London. Peter Hotton arranged for it to be printed in Amsterdam when London printers were unenthusiastic about the project.

[80] *Further Correspondence*, p. 112.

Ray seems never to have been entirely satisfied with his plant classification system. Although the practical exercise of systematizing plants for the *Historia Plantarum* 1686, 1688, 1703) and the *Synopsis stirpium Britannicarum* (1690) convinced him of the soundness of a grouping plants based on any relevant set of attributes, his views on the proper criteria for taxonomy continued to evolve. Furthermore, there are endless possibilities for classification, and Ray was challenged by Tournefort in France and Rivinus (Bachman) in Germany, each of whom had developed valid methods within their own culture and intellectual environment. Ray modified and refined his scheme in light of their criticisms and his responses were published as the *Dissertatio de methodus* (1696) and the *Methodus emendata* (1703).[83] He continued to insist, however, that proper classification relied on an array of morphological similarities and was not determined by rigid adherence to a limited range of characteristics. Ray's responses, moreover, continued to maintain the conventions of civility and gentlemanly discourse which characterise all his communications. Eventually, Ray extended his natural history project to include not just the classification of plants but all of living nature, and proposed systems to arrange animals, insects and fish.[84]

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[81] Robert Boyle, 'Origin of forms and qualities' (1666), *Selected philosophical papers of Robert Boyle*, ed. M. A. Stewart (Indianapolis: Hackett, 1991), pp. 1-96.

[82] *Ibid.*, p. 39.

[83] I have considered Ray specifically within a local, English context. For discussions of Ray's debate over classification principles with the continental taxonomists Tournefort and Rivinus, see specially the articles by Cain, 'John Ray on 'Accidents'; A. J .Cain, 'John Locke on Species,' *Archives of Natural History* 24(3) (1997), pp. 337-360; and Philip Sloan, 'John Locke, John Ray and the problem of the natural system,' *Journal of the History of Biology* 5 (1979), pp. 1-53.

Conclusion

Scientific classification, as the philosophical ambition of natural history, is a uniquely human activity in which categories are constructed by historical agents acting within a particular social organization, moral order and intellectual framework. A specific scheme for classification does not represent the only 'true' or 'real' set of organizing principles which are possible in any context, but only one selection from an array of potential choices. Therefore the acceptance of any specific taxonomic scheme within a community rests on more than the establishment of valid philosophical principles, 'true' matters of fact, or appropriate methodologies. In Restoration England, natural history became an enterprise above all concerned with proper classification, in large measure due to the rivalry between Robert Morison and John Ray. Ultimately Morison's taxonomy and his sumptuous *Historia Universalis* were all but erased from the annals of the discipline and Morison himself is remembered as a plagiary. On the other hand, Ray became the founding father of natural history in England, the indisputable 'prince of English Botanists' and the 'British Linnaeus'. I have argued that the relationship between rival proposals for classification schemes by Morison and Ray and the ultimate success of Ray's taxonomy rested on personal credit and reputation for authorial legitimacy.

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[84] John Ray, *Synopsis animalium quadrupedum et serpentini* (London, 1693); Ray *Methodus insectorum* (London, 1705); and Ray *Synopsis avium et piscium* (London, 1713).

CHAPTER 9

Contingency and Consolidation: Raian Natural History Established, 1690-1705

> I returned, and saw under the sun, that the race is not to the swift, nor the battle to the strong, nor yet bread to the wise, nor yet riches to men of understanding, nor yet favour to men of skill; but time and chance happeneth to them all.
>
> Ecclesiastes IX. 11

By 1688 there was an identifiable community of competent natural historians in England who operated within a unique scholarly tradition, were committed to specific disciplinary practices and agreed upon the importance of taxonomy. During the 1690s, natural history was important at the Royal Society, especially the history of plants "which for Variety and Use, is one of the noblest and pleasantest Parts of Knowledge."[1] Thus, the practice of natural history became stabilized as a legitimate and respectable study of nature in England. The study of natural history, in fact, interpenetrated national history of the 1690s: a newly updated celebration of what educated Englishmen found remarkable about their own heritage, *Camden's Britannia* (London 1695), was "greatly improved" by the inclusion of county specific plant catalogues "communicated by the Great Botanist of our age, Mr. Ray."[2] While it is true that natural history had been seen as a suitable pastime for educated and cultured gentlemen during the Restoration, and Ray himself had been assiduous in promoting a rigorous approach to the study, these circumstances do not adequately explain why natural history in general and John Ray in particular began to enjoy an unprecedented popularity in the closing decade of the seventeenth century.

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[1] Wotton, *Reflections Upon Ancient and Modern Learning*, p. 252.

[2] Edmund Gibson, 'Preface', *Camden's Britannia (London 1695)* (London and New York: Johnson reprints, 1971). Gibson was, successively, Chaplain to John Tenison Archbishop of Canterbury (1698), rector of Lambeth (1703), Bishop of Lincoln (1716) and Bishop of London (1720). The scope of Camden's *Britannia* is indicated by its subtitle, 'A Chorographical Description of the Most Flourishing Kingdoms of England, Scotland and Ireland, and the Islands Adjoining, out of the Depth of Antiquity', first published in Latin in 1586, and translated into English by Philomen Holland in 1610. The usefulness of Camden's *Britannia* as an historical guide to England provided a model for the Victorian County Histories of the nineteenth century, which continued to include descriptions of the remarkable topographical, genealogical,

I have argued that specific natural philosophical projects may have become significant in the context of immediate and highly contingent circumstances of seventeenth-century England. For instance, many Anglican loyalists engaged themselves in the pursuit of pastoral pleasures during the Interregnum, and like the Roman poet Virgil retreated to their estates to cultivate their gardens, a circumstance which helped to transform the study of natural history into a respectable pastime for gentleman. I have also argued that during the early Restoration, the Royal Society promoted an experiential natural history not only as a means to resolve disputes in natural philosophy, but also as a model for consensus and stability in society more generally. I will similarly argue that in the 1690s, the rhetoric of natural history was used as a resource to promote a message of providentialism and order during a period especially marked by competing claims for authority in church and state as well as in natural philosophy. In particular, I argue that the rhetoric of Raian natural history presented a stable and consensual natural order which was precisely suited to urgent social concerns. Under these circumstances, John Ray became firmly established as a legitimate spokesman, not only for matters of natural history, but for pressing matters within English society more generally. After 1688, the Restoration political environment was irrevocably disturbed and reconfigured to accommodate the new regime of William and Mary and was a period intensely concerned with stabilizing a new political, religious and social order in the wake of the 'providential'

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antiquarian and natural historical features of each region.

revolution.

Natural History

There is little doubt that natural history within the Raian paradigm enjoyed general approbation during the 1690s, and that the philosophical study of plants in particular was received with approval. Of course, Ray himself had long enjoyed the support of the Royal Society, and all of his natural histories had been printed under its auspices. During the 1690s, the Society continued its traditional role as publisher of Ray's philosophical ventures. However the institution also began to emphasize Ray's contributions to natural history and especially to promote the reputation of "that incomparable botanist." Official Society printers were busy issuing new works by Ray, including the *Synopsis Methodica* (1690 and second edition 1696), the *Synopsis Methodica Animalium Quadrupedum et Serpentini generis* (London 1693), the *Stirpium Europearum extra Britannias nascentium* (London 1694), and Ray's response to Tournefort, the *Plantarum Methodis Dissertatio Brevis* (London 1696), as well as the third volume of the *Historia Plantarum* (1704). Even after Ray's death in 1705, the Royal Society continued to promote Ray's fame as a natural historian, printing the *Historia Insectorum* (London, 1710) and the *Synopsis Avium et Piscium* (London 1713).

One measure of Ray's enhanced standing at the Royal Society is clearly evident when we examine the title pages for the three volumes to his monumental *Historia Plantarum* (see Figs. 6, 7, 8). In 1686, the title of the work, *'Historia Plantarum'*, is featured prominently on the frontispiece of Volume I. While Ray's name is by no means inconspicuous, it appears in a smaller typeface near the foot of the page, and his affiliation with the Royal Society announced in yet in smaller print. Volume II, published two years later in 1688, advertised the work as "*Joannis Raii Historiae Plantarum.*" Although

Ray's name in the title remained in slightly a smaller typeface, the reworking of the volume as *'John Ray's History of Plants'* speaks to the recognition given to Ray as the authoritative, legitimate spokesman on plant matters. In 1688, this acknowledgement represented the work as not just *any* history of plants with implied an authoritative voice; rather, it represented the history of plants with Ray's authority on the matter made explicitly. Finally, in Volume III (London, 1704), the Royal Society assumed its share of credit for the production, and the work was now entitled *"Joannis Raii, Societatis Regiae Sociae, Historiae Plantarum Tomus Tertius."* Similarly, in 1696 the second edition of the *Synopsis Methodica Stirpium Britannicarum*, first printed in 1690, had its title reworked to become *"Joannis Raii Synopsis Methodica Stirpium Britannicarum,"* another declaration of the author as the legitimate voice on plant matters in England.

Members of Ray's community also became increasingly confident about the status of their enterprise and were especially active in promoting Raian natural history during the 1690s, in part through their participation in the Royal Society. Perhaps natural history's greatest supporter during the 1690s, and the individual Ray himself described as "most learned and extraordinarily skilled in *res herbaria*," "a most talented man and exceptional botanist" and "that most learned and willing gentleman,"[3] was the young physician Hans Sloane. Sloane soon became intensively involved in the affairs of the Royal Society, and during the 1690s was a Member of Council (1690-1699), Secretary (1693-1700) and editor of the *Philosophical Transactions* (1693-1712). Sloane, who was the author of several important natural histories, including *Catalogus Plantarum quae in Insula Jamaica* (London, 1696) and later the elaborate two volume *Voyage to the Islands of Madeira, Barbadoes, Nieves, St. Christopher's and Jamaica* (London 1707 and 1727),

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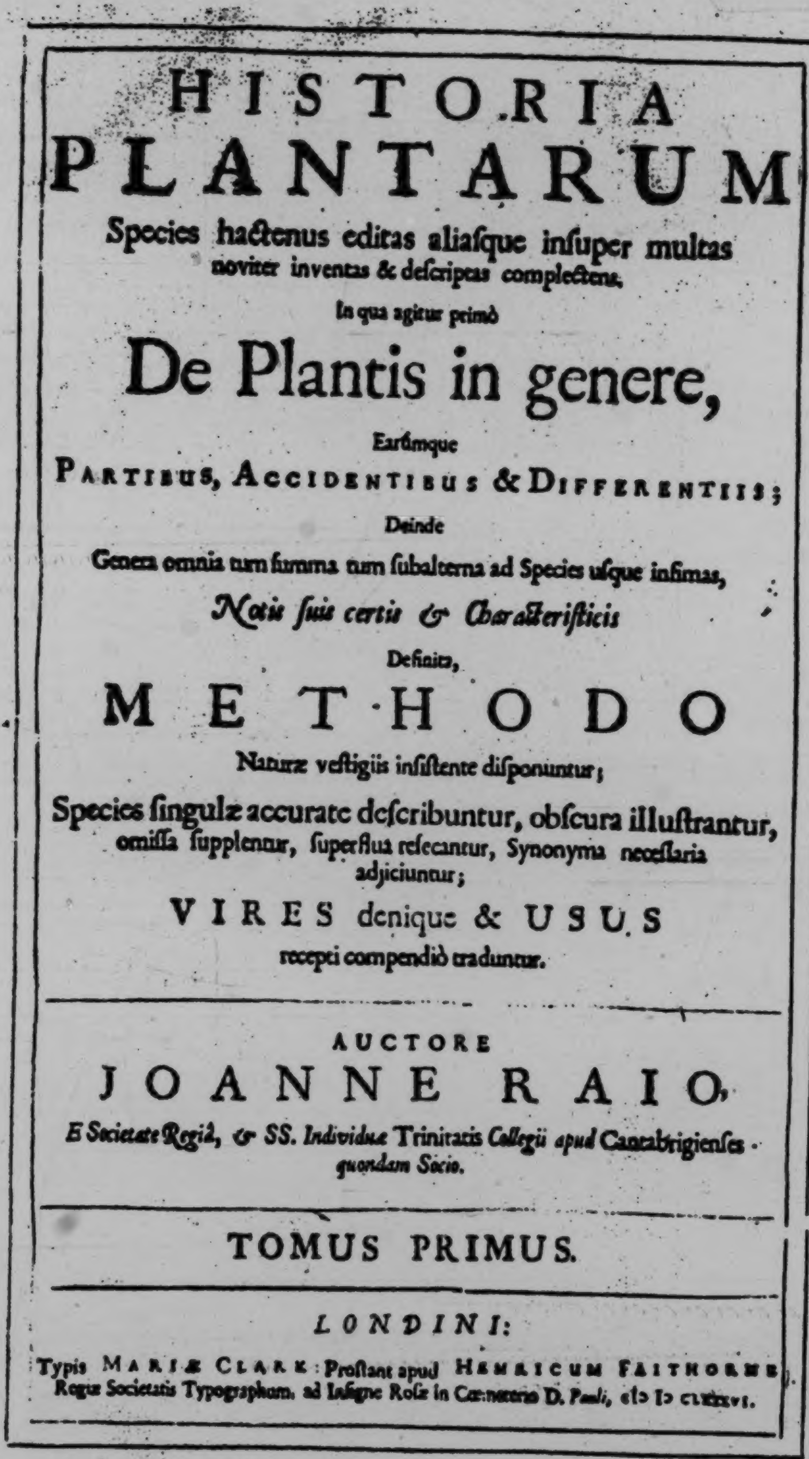
[3] John Ray, *Historia Plantarum*, Vol. 1 (London, 1686), pp. 199, 228, 939.



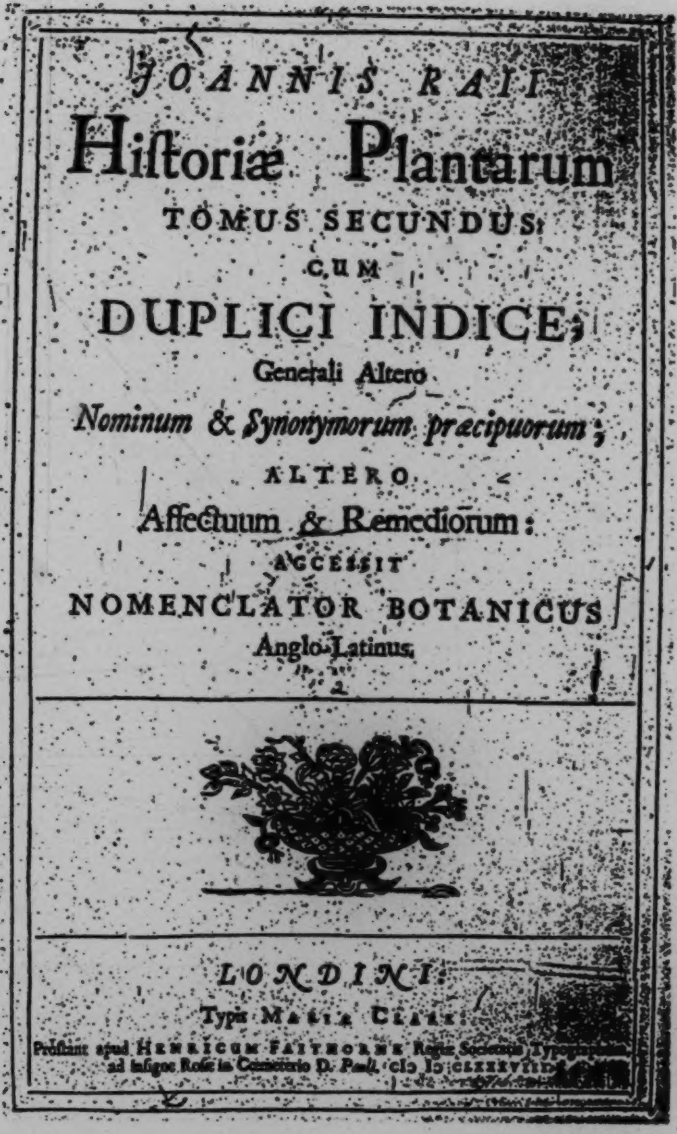
HISTORIA
PLANTARUM
Species hactenus editas aliaſque inſuper multas
noviter inventas & deſcriptas complectens.
In qua agitur primò
De Plantis in genere,
Earúmque
PARTIBUS, ACCIDENTIBUS & DIFFERENTIIS;
Deinde
Genera omnia tum ſumma tum ſubalterna ad Species uſque infimas,
Notis ſuis certis & Characteriſticis
Definita,
METHODO
Naturæ veſtigiis inſiſtente diſponuntur;
Species ſingulæ accurate deſcribuntur, obſcura illuſtrantur,
omiſſa ſupplentur, ſuperflua reſecantur, Synonyma neceſſaria
adjiciuntur;
VIRES denique & USUS
recepti compendiò traduntur.

AUCTORE
JOANNE RAIO,
E Societate Regiâ, & SS. Individuæ Trinitatis *Collegii apud* Cantabrigienſes
quondam Socio.

TOMUS PRIMUS.

LONDINI:
Typis MARIÆ CLARK: Proſtant apud HENRICUM FAITHORNE
Regiæ Societatis Typographum, ad Inſigne Roſæ in Cœmeterio D. *Pauli*, cIↄ Iↄ CLXXXVI.

Fig. 6. John Ray, *Historia Plantarum*, Vol. I (London, 1686)



JOANNIS RAII

Hiſtoriæ Plantarum

TOMUS SECUNDUS;

CUM

DUPLICI INDICE;

Generali Altero

Nominum & Synonymorum præcipuorum;

ALTERO

Affectuum & Remediorum:

ACCESSIT

NOMENCLATOR BOTANICUS

Anglo-Latinus.

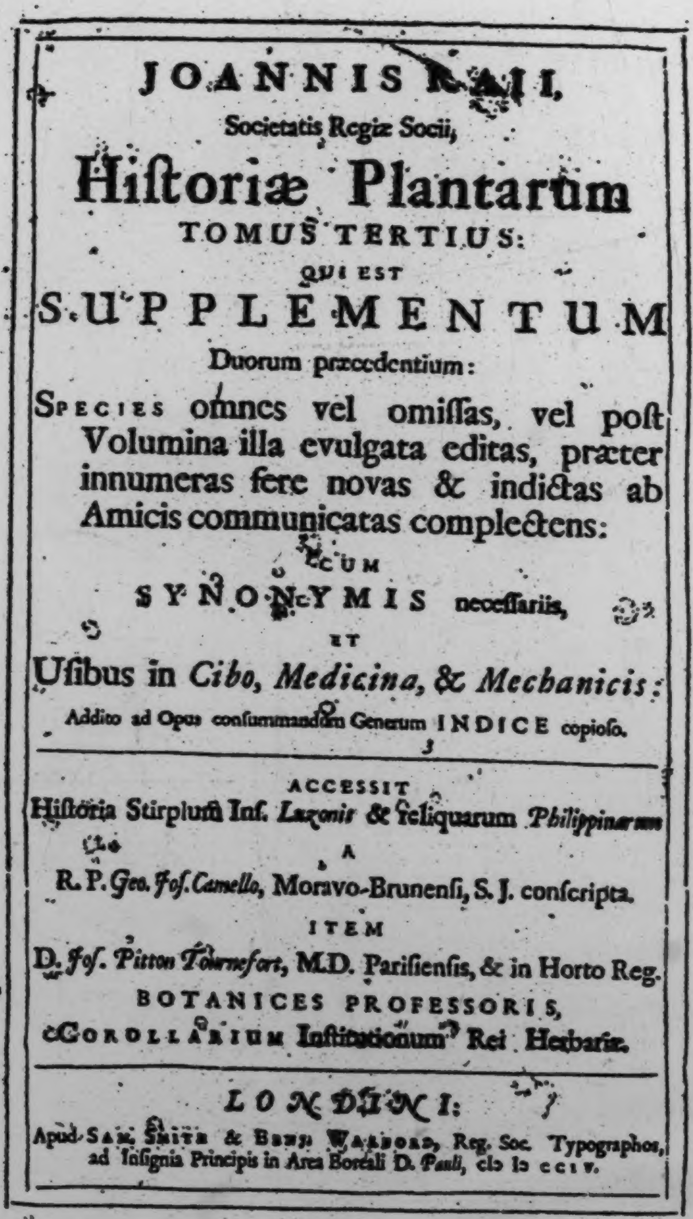
LONDINI:

Typis Mariæ Clark:

Proſtant apud Henricum Faithorne Regiæ Societatis Typograp[illegible]

ad Inſigne Roſæ in Cœmeterio D. *Pauli.* CIↄ Iↄ CLXXXVIII.

Fig. 7. John Ray, *Historia Plantarum*, Vol. II (London, 1688).



JOANNIS RAII,
Societatis Regiæ Socii,
Hiſtoriæ Plantarum
TOMUS TERTIUS:
QUI EST
SUPPLEMENTUM
Duorum præcedentium:
Species omnes vel omiſſas, vel poſt Volumina illa evulgata editas, præter innumeras ſere novas & indictas ab Amicis communicatas complectens:
CUM
SYNONYMIS neceſſariis,
ET
Uſibus in *Cibo, Medicina,* & *Mechanicis:*
Addito ad Opus conſummandum Generum INDICE copioſo.

ACCESSIT
Hiſtoria Stirpium Inſ. *Luzonis* & reliquarum *Philippinarum*
A
R. P. *Geo. Joſ. Camello,* Moravo-Brunenſi, S. J. conſcripta.
ITEM
D. *Joſ. Pitton Tournefort,* M.D. Pariſienſis, & in Horto Reg.
BOTANICES PROFESSORIS,
COROLLARIUM Inſtitutionum Rei Herbariæ.

LONDINI:
Apud Sam. Smith & Benj. Walford, Reg. Soc. Typographos,
ad Inſignia Principis in Area Boreali D. *Pauli,* CIↃ IↃ CCIV.

Fig. 8. John Ray, *Historia Plantarum,* Volume III (London, 1704).

dedicated himself to becoming fabulously wealthy, collecting voraciously and patronizing natural history, especially his beloved botany, in the Raian tradition.[4]

By 1700 then, natural history had become fully entrenched as one of the most important methods for structuring and interpreting nature, especially living nature. During the eighteenth century, the status of natural history as the proper study of nature would continue to develop its identity as a vigorous scientific discipline in England. However, there was nothing inevitable about the stability of Raian natural history at this specific time and place.

The Glorious Revolution

The deeply divisive issues that had fuelled political and religious discord during the early seventeenth century also animated debates after 1660. The complex history of the Restoration shows that Charles II continued to be challenged by dissenting groups and their political allies, circumstances which mitigated against permanent social or political stability in the period. During the 1680s however, Charles had worked to establish a strong alliance with loyal Anglicans, and especially after the Exclusion crises, a close relationship existed between the crown and its supporters who soon came to enjoy a monopoly of power in church, state and education. By 1688, this faction within English society, characterized by support for the Church of England, animosity toward dissenters and obedience to the crown, may be associated with Tory politics. The Tories saw the most serious challenge to their dominant position arising from the opposition launched by a Whig political faction. After 1682, Charles had been successful in neutralizing whatever political organization his Whig opposition possessed, and by refusing to call Parliament, the crown's opponents were denied an institutional platform for attack. Charles also purged local judicial benches and town corporations of individuals opposed to crown policies and replaced them with strong supporters of the state and the Church of England.[5] Tory loyalists were further united in their determination to protect the Established Church. Individuals who refused Anglican conformity were seen as Whig sympathizers, and dissent against the 'church by law established' was persecuted with vigour, according the statutes passed by the Cavalier parliament during the 1660s.[6]

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[4] Hans Sloane, *Catalogus Plantarum quae in Insula Jamaica sponte proveniunt aut volgo coluntur* (London, 1696); Sloane, *A Voyage to the Islands of Madera, Barbadoes, Nieves, St. Christopher's, and Jamaica; with the Natural History of the Herbs and Trees, four-footed Beasts, Fishes, Birds, Insects, Reptiles, &c. To which is prefixed, An account of the Inhabitants, Air, Water, Diseases, Trade, &c. of that place, with some relations concerning the neighbouring continent and Islands of* America, Vol. I (London 1707), Vol. II (London, 1727); Munk, *Roll of the Royal College of Physicians*, Vol. II, pp. 460-467; Britten and Boulger, *Biographical Index*, p. 289; *DNB*, Vol. 18; E. St. John Brooke, *Sir Hans Sloane: The Great Collector and his Circle* (London: Batchworth Press, 1954).

When the Catholic James Stuart was crowned in 1685, his attempts to remodel parliament and form new alliances with dissenting religious groups such as the Quakers, as well as Catholics, were seen as direct attempts to challenge Tory hegemony. Tory Anglicans, who had defended James's right to succeed Charles to the throne, were especially alienated by his use of the royal powers of suspension and dispensation to promote non-Anglicans. The Tories interpreted these measures as direct attacks on the Church of England, which not only undermined the established laws passed by Parliament but destroyed their own monopoly on power in the process. The Tories developed a well articulated, carefully considered and coherent set of positive ambitions which committed them to the rule of the law, and especially those laws that had been established to protect both Church and State from subversives. Many individual Tories also waged active campaigns against James especially during 1687 and 1688 protesting his Catholicizing policies. The manifestly unpopular regime of James ultimately resulted in an invitation to William of Orange, husband of James's Anglican daughter Mary, to invade England in autumn 1688.[7]

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[5] See especially Tim Harris, *Politics under the Later Stuarts, Party Conflict in a Divided Society 1660-1715*, eds. John Morril and David Cannadine, Studies in Modern History (London and New York: Longmans, 1993); Geoffrey Holmes, *The Making of a Great Power 1660-1722* (London and New York: Longmans, 1993); J. R. Jones, *County and Court: England 1658-1714* (London: Edward Arnold, 1978); J. P. Kenyon, *Revolution Principles: The Politics of Party 1689-1720* (Cambridge: Cambridge University Press, 1977); and J. H. Plumb, *The Growth of Political Stability in England, 1675-1725* (London: Macmillan, 1967).

[6] Harris, *Politics under the Later Stuarts*, pp. 81-108.

It was precisely the Tory Anglican faction within English society which played the decisive role in the invitation to William, the revolution of 1688 and the settlement of the crown on William and Mary in 1689. Most accounts accept that the withdrawal of active gentry support for James was important for the success of William of Orange's invasion.[8] However, the active role played by Tories who were conspicuous in their determination to oppose James or to advance the interests of William of Orange was crucial in determining the outcome of events in 1688. Some of the most vigorous Tory efforts came from Ray's intimate friends and supporters Henry Compton and Charles Hatton.

Henry Compton's royalist pedigree and his own position as Bishop of London made him ideally suited for a central role in the events of 1688 and in fact Compton was one of the Tory clergy most openly hostile to James and his anti-Anglican policies. Opposition to James's regime had led to Compton's dismissal from the Privy Council and his removal as dean of the Chapel Royal. As well, Compton's disagreement over royal policy had brought him before the Ecclesiastical Commission which in turn relieved him of episcopal responsibilities. Rather than merely retiring to his Bishop's palace at Fulham and engaging in his favourite botanical pursuits, Compton conspired actively against James, and during 1688 travelled throughout England to enlist allies and to coordinate specific arrangements for an uprising against James. Compton became one of only seven signatories on the invitation to William of Orange to invade, upon which William insisted prior to making a commitment to the British. In November 1688 and at the height of William's invasion, Compton accompanied Mary and her sister Anne in their escape to the Anglican stronghold at Nottingham. In a singular declaration of his allegiance to the Anglican cause, Compton also accepted a colonelcy in a volunteer regiment of soldiers, and marched in full regalia at the head of his company to join supporters at Oxford. After William's victory, Compton would continue to play a leadership role in stabilising the new regime; it was Henry Compton, and not William Sandcroft Archbishop of Canterbury, who crowned William and Mary as sovereigns of England on 11 April 1689.[9]

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[7] *Ibid.*, pp. 117-128.

[8] William Speck, *Reluctant Revolutionaries: Englishmen and the Revolution of 1688* (Oxford: Oxford University Press, 1988).

Charles Hatton, to whom Ray had already dedicated the *Methodus Plantarum Nova* (1682) and the monumental *Historia Plantarum* (1686, 1688), declared his own political allegiances no less dramatically than Compton. The younger son of Baron Christopher Hatton (1605-1670), Charles was also the brother of another Baron Christopher, FRS and governor of Guernsey, who was known as a faithful servant to the Stuart crown but in 1687 counted among the opponents to James II and in 1688 recruited by Henry Compton.[10] Charles held a commission as captain of grenadiers in James's army under the Earl of Huntingdon, and in October 1688 was ordered to join his regiment at Plymouth to prepare for the expected invasion of the Prince of Orange. Reporting on the situation from Plymouth, Charles wrote to the Baron, "[a]s to my own particular, I shall endeavour to act according to those principles of loyalty in which I have been educated, and to which I am obliged both by my religion and allegiance, and submit myself to whatever state Providence designes."[11] In November, Hatton refused to lead his company against William, and so became the only officer who resisted Lord Huntingdon's attempt to secure Plymouth for James.[12] During the course of William's invasion, many army officers and other crown servants followed Hatton's example of joining the Orange camp. Indeed, the army defections were especially crucial in demoralizing James, who had believed himself to be strong militarily.[13]

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[9] David H. Hosford, *Nottingham, Nobles and the North: Aspects of the Revolution of 1688*, The Conference on British Studies and Wittenberg University (Hamden, Connecticut: Archon Books, 1976) pp. 38-43; Hosford, 'Bishop Compton and the Revolution of 1688', *Journal of Ecclesiastical History* 23 (1972), pp. 209-218; DNB, vol. 4, pp. 899-903; *Biographia Britannica*, pp. 1425-1432; Venn and Venn, *Alumni Cantabrigiensis*, Vol. 1, Part I , p. 378; Britten & Boulger, *A Biographical Index*, p. 71; James Britten, *The Sloane Herbarium: an annotated list of the Horti Sicci composing it*, rev. and ed. J. E. Dandy (London: British Museum, 1958), pp. 84-87, 114-115; E. Carpenter, *The Protestant Bishop: Being the Life of Henry Compton 1632-1713, Bishop of London* (Longmans, New York, 1956).

[10] Charles Hatton to Christopher Hatton, 4 July 1688, *Correspondence of the Family of Hatton being chiefly letters addressed to Christopher First Viscount Hatton, AD. 1601-1704*, ed. Edward Maunde Thompson, Vol. II, Camden Society, n.s. 23 (1878 rpt. London and New York: Johnson Reprints, 1965), p. 86.

The successful invasion of William and James's flight from England in December 1688 demanded immediate response to secure the authority of the new regime. A Convention parliament was convened in January 1689 and moved remarkably quickly to reestablish stability in government and reach agreement to settle the crown on William and Mary. Although there was a predominance of Tories in the House of Lords, there was no clear majority of either Tories or Whigs in the House of Commons. The revolution settlement, therefore, was a pragmatic compromise which had to satisfy the mixed House of Commons, the Tory majority in the House of Lords as well as William and Mary, and its successful conclusion relied on the goodwill and cooperation of all parties. However, the peaceful transition of the crown to William and Mary in 1689 especially attests to the degree of cooperation and accommodation made possible by Tory Anglicans. Enshrined in the "Act for the Further Limitation of the Crown and Better Securing the Rights and Liberties of the Subject," better known as the 'Bill of Rights', the revolution settlement was a conservative document, crafted primarily by the Tories and designed to satisfy the grievances of the Anglicans. The Tories in particular were sensitive to the replacement of a legal sovereign; indeed church pulpits rang with sermons commemorating the removal and execution of Charles I, including John Tillotson's sermon of 31 January 1689, preached in thanksgiving to "Almighty God for having made His Highness The Prince of Orange the Glorious Instrument of the Great Deliverance of this Kingdom from Popery and Arbitrary Power."[14] It was therefore at Tory insistence that the Oath of Allegiance was framed to omit the customary acknowledgement of *de jure* sovereignty, and in its stead required loyalty to William and Mary as *de facto* rulers. The importance of this measure is crucial; even with the concessions to Tory tender consciences to recognize the sovereignty of the new regime 'in fact' rather than 'by right', the oath was unpalatable to many Tories. More than 400 clergy, including the Sandcroft, Archbishop of Canterbury, refused to undertake the oath of allegiance to the new rulers, with the result of yet further religious disharmony within the Church.[15] John Tillotson, Dean of Canterbury (1672-89), Canon of St. Paul's (1675-91) and in 1690 Clerk of the Closet to William III, was one of the most vocal of the moderate Anglican clergy and a Fellow of the Royal Society.[16]

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[11] Charles Hatton to Christopher Hatton, 16 October 1688, *Correspondence of the Family of Hatton*, p. 96.

[12] *DNB*, vol. 9, pp. 162-164; Henning, *House of Commons 1660-1690*, Vol. 2, p. 512; Miles Hadfield, *A History of British Gardening*, 3rd edn (London: John Murray, 1979), pp. 92, 134-139.

[13] J. R. Western, *Monarchy and Revolution: The English State in the 1680s* (Blandford Press: London, 1972), pp. 265-283.

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[14] John Tillotson, *A Sermon Preached at Lincoln's-Inn-Chappel, on the 31st of January, 1688, Being the Day Appointed for a Publick Thanksgiving to Almighty God for having made His Highness The Prince of Orange the Glorious Instrument of the Great Deliverance of this Kingdom from Popery and Arbitrary Power* (London, 1689).

[15] Jennifer Carter, 'The Revolution and the Constitution', *Britain after the Glorious Revolution*, ed. Geoffrey Holmes (London: Macmillan, 1969), pp. 39-58.

[16] We must assume that Tillotson saw some value in his association with the Royal Society. Although he was an 'inactive' member, Tillotston neither resigned his fellowship nor was expelled from the Society. In 1684, in return for books and a financial contribution, Tillotson became exempt from paying his subscription. See Hunter, *The Royal Society and its Fellows*, pp. 188-189.

From the pulpit, Tillotson preached about the threat, both civil and spiritual, posed by religious disagreement. He was especially concerned with dangers arising from the "great Dissension and Division, great uncharitableness and bitterness of spirit among those of the same religion."[17] Tillotson also urged consensus in religious matters for "what greater good can we do to the best Religion, how can we better serve the interests of it in all parts of the world, than by being at peace and unity among ourselves, here in England."[18]

A strong, vital and united national Church was seen in many quarters of the English establishment as a prerequisite for a stable civil society during the 1690s; however, many prominent Tories also recognized the need for some measure of accommodation with nonconformity. Two interrelated bills were prepared for presentation to Parliament on the issue and Tory intentions for both bills were consistent with their desire to sustain the established Church. The Comprehension Bill extended the traditional ideal of comprehending moderate nonconformity into a 'broad' Church of England and was ultimately unsuccessful because of High Anglican opposition. The ultimately successful and Tory-sponsored Toleration Bill allowed a limited freedom of worship for nonconformists with immunity from penal laws, although the penal laws themselves were not revoked. The rights of nonconformists to participate in government or hold office continued to be restricted, and the requirement of Anglican communion for office holders was maintained.[19] The failure of the Comprehension Bill and the passage of the

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[17] John Tillotson, *A Sermon Preached before the King and Queen at Hampton Court, April 14, 1689*, Published by his Majesty's Special Command (London, 1689), p. 15.

[18] John Tillotson, *A Sermon Preached at St. Mary le Bow Before the Lord Mayor, Court of Alderman and Citizens of London on Wednesday 18 June, a day appointed by their Majesties for a Solemn monthly fast* (London, 1690), p. 33.

[19] John Spurr, *The Restoration of the Church of England Church* (New Haven and London: Yale University Press, 1991); Henry Horowtiz, *Parliament policy and politics in the Reign of William III*, (Manchester, University of Manchester Press, 1977).

Toleration Bill together with internal divisions within the Church over William's legitimacy to govern as King, effectively meant that the Church of England was required to renegotiate its status as an institution and reestablish its authoritative role in society.

In the immediate aftermath of the Glorious Revolution, then, the safety and stability of both state and church continued to be a matter of utmost concern. At the end of 1689, the gravity of the situation is apparent in John Evelyn's comment that, "Matters [are] universally in great Confusion with us, nothing in any sort of apparent method for our preservation: The Lord Jesus avert our danger."[20] Early in 1690, new elections returned a predominantly Tory House of Commons and suggests that the Tory Anglican settlement had received widespread approval in the political nation. William now had the opportunity to appoint a predominantly Tory ministry to support his policies and consolidate his mandate.

The Royal Society, John Ray and Natural Theology

Throughout the seventeenth century, the advancement of 'proper' natural philosophy had been a feature of the political and religious landscape in England. Natural history and its methods, I have argued, had been the instrument by which the Royal Society had sought to resolve disagreement in natural philosophy.[21] Firmly grounded on the presumed orderliness and stability of the universe, natural history also depended upon 'the great Governour of the World' who disposed of the affairs of both nature and of men according to a natural, God-given harmony. It comes as little surprise to find that the rhetoric of natural history acquired socio-political overtones during the 1690s and that

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[20] *Evelyn's Diary*, vol. 5, p. 39. Evelyn was soon reporting "a plot for a general rising against the new Government," p. 41

[21] See Chapter 4 above; but especially Shapin and Schaffer, *Leviathan and the Air-Pump* for the significance of the relationship between social order and intellectual order.

John Ray and his natural history project became a key element in the Royal Society's public image.

In 1690, the *Synopsis Methodica Stirpium Britannicarum* (1690), Ray's first taxonomic work of the new regime, was printed by the Royal Society. The *Synopsis* was much more than another plant taxonomy, although certainly it was the first attempt to inventory and classify the flora of an invigorated British nation representing England, Ireland, Scotland and Wales. Ray also used this work to celebrate the emerging political regime of William and Mary whom he saw as having providentially delivered Britain from social, religious and political danger. Ray's eulogy to the new rulers was a recapitulation of Anglican ambitions for the regime: a nation founded upon the practice of true religion, the security of person and property, the cultivation of legality and justice, the pursuit of orthodox philosophy, and an enduring, stable society where "each order . . . received its proper privileges and immunities." As a unique measure of Ray's own political sentiments in 1690, a lengthy passage from the *Synopsis* on contemporary events deserves to be quoted in full.

> Above all I thank God that He allowed me to live long enough to see this dear land endowed by divine favour with princes such as in the recent stormy times I longed for but scarcely dared to expect, princes chaste and religious and distinguished in every virtue. Under their quiet rule, if only God grant us peace, we can rely upon prosperity and a real [golden age]. If their subjects are ready to fashion their characters after their example, I see no reason why our people should not attain to perfect happiness. Superstition has been overthrown. Pure and reformed religion is honoured. Its profession and practice encouraged by example. The yoke of slavery which our necks have never learnt to endure was beginning to oppress us; it has been broken: our heritage of freedom has been restored and secured: each order has received its proper privileges and immunities. The unbridled licentiousness of a wanton soldiery that insulted free-born citizens in their own houses with impunity and filled the land with violence, murder and outrage has been repressed: the guardianship of his estate has been made secure and unafraid for us all. The majesty of the country's laws, the very foundation of the realm, is inviolate. Philosophy and all sound learning, now that the favour of princes smiles upon the efforts and stimulates the industry of scholars, show promise of wonderful advances.
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> To secure the perpetuity of these benefits our first prayer should be that the August

> Sovereigns whose virtue has won them and whose counsels and foresight have preserved them for us may be as immortal as they are essential. That is indeed a condition not allowed to mankind: but valour begets valour, and we would humbly pray to God that when our Sovereigns full of years and glory, ripe for heaven, have passed to the abode of the blessed, they may be succeeded from the same exalted house by a continuing line of monarchs, filled with the same spirit, equal in all but years to their forebears, under whose happy rule we may enjoy all the blessings of peace and moral excellence.[22]

In December 1690, Robert Southwell was elected President of the Royal Society, an office which his 'worthy Friend' John Evelyn had resisted "with much difficulty, by all means [resolved] to avoid it in this ill Conjuncture of publique affairs."[23] A career diplomat under Charles II, Southwell had emerged from retirement in 1689 to accompany William to Ireland and was subsequently rewarded by an appointment as Secretary of State for that territory. Thus, we may assume Southwell to be sympathetic to William and his agenda for England. Southwell had been a Fellow of the Royal Society since 1662, and actively involved in the affairs as a member of Council.[24] As President therefore, Southwell would be in a crucial position to ensure the continued reputation of the Royal Society "for Integrity, Honesty, Piety, Loyalty, and Good Affection toward His Majesty, His Crown and Dignity."[25] Southwell held the office of President during the years 1690-1695 and remained active as a member of Council until 1699, [26] a period in Royal Society affairs which was marked by developing tensions between the predominant

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[22] John Ray, 'Preface, *Synopsis Methodica Stirpium Britannicarum* (London, 1690), trans. C. E. Raven, *John Ray, Naturalist: His Life and Works* (Cambridge, etc.: Cambridge University Press, 1950, rpt. 1987), p. 252.

[23] *DNB*, Vol. 18, pp. 707-712; *Evelyn's Diary*, vol. iv, p. 203, n.4; vol. v, p. 39.

[24] Hunter, *The Royal Society and its Fellow*, pp. 156-157. Southwell was President 1690-95 and member of council during the years 1669, 1673-5, 1677, 1679, 1681 and 1689-99.

[25] Sprat, *History of the Royal Society*, p. 136.

[26] Hunter describes Southwell's presidency as "very active". *The Royal Society and its Fellows*, p. 156-157.

'natural history party' and a rapidly forming ''mathematicians' party'.[27]

I) The Wisdom of God

In post-revolutionary England, the notion that events in the nation had been guided by God's providence working through 'the laws of nature' was a rhetorical strategy used by both theologians and politicians.[28] For instance, John Tillotson saw a direct relationship between the affairs of man and the affairs in nature and had designated the political change of 1688 as "the thing which the Providence of God intended to a happy issue and effect."[29] In a sermon before the House of Commons in June 1690, Tillotson argued that, "nothing can be a greater argument of Providence, than that there is such an order of Causes laid in Nature, that in ordinary course every thing does usually attain its end."[30] For Tillotson, as for many others in the early years of William's rule, the principle of divine purposeful order in state as in nature, made for a moderate, reasonable and socially safe Christianity. Further, within the context of the power interests of Augustan England, 'reasonableness' implied that existing civil and religious authorities were the most competent judges of what constituted 'moderate', 'reasonable' and 'socially safe', and thereby the most competent to judge on such matters as the correct reading of nature.

Ray's own hopes for "all the blessings of peace and moral excellence" in England also rested upon the continued security of the Anglican Church which remained under threat from religious heterodoxies as well as political divisions within the church itself. Ray hoped to serve the interests of the Church, if not from the pulpit, then with his pen. "By Verture of my Function," Ray reasoned, "I suspect myself to be obliged to Write something in Divinity, having Written so much on other Subjects: For being not permitted to serve the Church with my Tongue in Preaching, I know not but it may be my Duty to serve it with my Hand by Writing."[31] By fall 1690, he was revising a series of divinity exercises once delivered at Cambridge while he was a Fellow at Trinity College; although the *Wisdom of God* has often been seen as a defense against atheism, Ray's original intention had been as a persuasive to religious harmony during the Interregnum.[32] Ray's message of conciliation was especially relevant 'in this ill conjuncture of publique affairs' and renewed religious divisions. In May 1691 his commonplace exercises were printed under Royal Society auspices as *The Wisdom of God Manifested in the Works of Creation* (London, 1691). In this modest tract on natural theology, Ray successfully united the theme of Divine Providence with notions of consensus, harmony and stability in nature, and so in society more generally. The result was a small volume grounded in Ray's own rigorous brand of natural history, and displayed nature in all its order, complexity and diversity.

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[27] Mordechai Feingold, 'Mathematicians and Naturalists: Sir Isaac Newton and the Royal Society', *Isaac Newton's Natural Philosophy*, eds. Jed. Z. Buckwald and I. Bernard Cohen (Cambridge MA and London: MIT Press, 2001), pp. 77-102.

[28] Larry Stewart, 'Providence and the Newtonians', *The Rise of Public Science: Rhetoric, Technology, and Natural Philosophy in Newtonian Britain, 1660-1750* (Cambridge: Cambridge University Press, 1992), pp. 31-59.

[29] Tillotson, *A Sermon Preached at Lincolns-Inn Chappel*, p. 28.

[30] John Tillotson, *A Sermon Preached Before the House of Commons on Wednesday the 16th of April: a day appointed by their Majesties for a Solemn Monthly Fast* (London, 1690), sig. A3-A3v.

The linguistic structure and rhetorical strategies employed by Ray in the *Wisdom of God* promoted a model of cooperation and consensus in Augustan England.[33] Ray's voice was one of moderation, accommodation and conciliation, intended to persuade by reason and manifest evidence. Ray's ambitions were to obtain as wide a readership as possible, from "the greatest and subtlest Adversaries, but intelligible also to the meanest Capacities." [34] His strategies included an easily comprehensible prose style, and a "manner of delivery and expression [which] may be more suitable to some Men's apprehension and facile to their understanding."[35] *The Wisdom of God* was couched in a language of inclusion and shared experience: all could experience God's creations for themselves and all could agree on the existence of God, "For you may hear illiterate persons of the lowest Rank of the Commonalty affirming, that they need no Proof of the being of a God, for that every Pile of Grass, or Ear of Corn sufficiently proves that. For, say they, All the men of the World cannot make such a thing as one of these; and if they cannot do it who can, or did make it but God?"[36]

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[31] John Ray, *The Wisdom of God Manifested in the Works of the Creation, Being the Substance of some common Places delivered in the Chappel of Trinity-College, in Cambridge* (London, 1691), sig. A 6.

[32] See Chapter 2, above. I argue that Ray's original purpose for writing the commonplaces had been to promote consensus in matters of religion at Cambridge, and especially in a community divided by an array of beliefs and practices about religion, as well as perceived threats from atheism and enthusiasm.

[33] Lisa M. Zeitz, 'Natural Theology, Rhetoric, and Revolution: John Ray's *Wisdom of God*, 1691-1704', *Eighteenth Century Life* 19 (1994), pp. 120-133.

Importantly, *The Wisdom of God* has long been recognized as a unique cultural product of the contemporary political and religious climate in England. The work has been placed at the centre of Augustan concerns with a providentially-guided and therefore orderly universe and in fact *The Wisdom of God* became an important intellectual resource to establish the rational existence of God using arguments from nature's apparent design.[37] Ray argued that knowledge of God and his powers were revealed not only in the books of scripture but in the book of nature as well. The study of nature, therefore, was justified as a means to confirm the truths which were revealed in scripture. Ray's intentions in all of his works had been to "illustrate the Glory of God in the knowledge of the works of Nature or Creation" and to "honour the infinite wisdom and goodness of God the Creator."[38] Ray had already introduced *The Ornithology of Francis Willughby* (London 1678) with a passage from Psalms, "How manifold are thy works, O Lord? In wisdom has thou made them all: The Earth is full of thy riches" and he again utilized the verse to serve as a prolegomenon for *The Wisdom of God*.[39] Ray's intentions in 1690 however, went far beyond a catalogue of "the Composition, Order, Harmony, and uses" of all of God's creations.[40] The more important ambition for the *Wisdom of God* was to provide convincing demonstrations from nature to foster a belief in God and his powers. The book was uncontentious, Ray claimed, because all of his arguments were grounded upon well-attested and generally-accepted experiences with which all could agree. *The Wisdom of God* was specifically intended to provide demonstrations of God and his powers solidly based not on speculation or divine illumination, but on matters of fact, and Ray emphasized "I have been careful to admit nothing for matter of Fact or Experiment but what is undoubtedly true, lest I should build upon a Sandy and Ruinous Foundation; and by the admixture of what is false, render that which is True or suspicious."[41]

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[34] Ray, *Wisdom of God*, Sig. A7.

[35] *Ibid.*, Sig. A5v.

[36] *Ibid.*, Sig. A6v.

[37] Neal C. Gillespie, 'Natural History, Natural Theology and Social Order: John Ray and the "Newtonian Ideology"', *Journal of the History of Biology* 20(1) (1987), pp. 1-49.

The Wisdom of God argued for a harmonious, virtuous and rational society founded upon a religion of harmony, virtue and reason. It was designed to achieve consensus on the truths of scripture as revealed in nature, and thereby to act as a persuasive to unite different opinions in religion. Thus, it was crucial for Ray's purposes to be able to provide incontestable evidence from nature to demonstrate God's activity in the world. Ray believed, like John Tillotson, "If there be a God and a Providence, it is reasonable that things should be thus: Because a Providence does suppose all things to have been first wisely fram'd, and with a fitness to attain their end."[42] Evidence of design, of divine providence, of purposes and ends in nature also inferred evidence of God's design in society. Ray argued that the dependence and "mutual subserviency [of all of God's creatures] to each other, and unanimous conspiring to promote and carry on the public Good, are evident Demonstrations of his Sovereign Wisdom."[43] If God had providentially arranged the affairs of the world according to a wise and judicious plan, then God's purpose could be seen in the body politic no less than in the body of man. "The Body of Man," Ray argued

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[38] Ray, 'Preface to the Reader', *Ray's Flora of Cambridgeshire*, pp. 24, 26.

[39] Francis Willughby, *The Ornithology of Francis Willughby of Middleton in the County of Warwick Esq; Fellow of the Royal Society* (London, 1678), frontispiece.

[40] Ray, *Wisdom*, Sig. A6v.

[41] *Ibid.*, Sig. A6.

> May thence be proved to be the effect of Wisdom, because there is nothing in it deficient, nothing superfluous, nothing but hath its End and Use; . . . *The Eye cannot say to the Hand I have no need of thee, nor the Head to the Feet I have no need of you. I Cor. 12 21.* that I may usurp the Apostles similitude. The Belly cannot quarrel with the Members, nor they with the Belly for her seeming Sloth; as they provide Meat for her, so she concocts and distributes it to them.[44]

The Wisdom of God would become one of the most enduring and popular works of physicotheology, passing through many editions during the eighteenth century and eventually becoming known as "the paradigmatic British treatise on natural theology."[45] Ray, certainly, was not the first natural philosopher to be concerned with promoting a 'reasonable' natural theology based on the notion of a divine providence active in the world and in the affairs of men. During the seventeenth century, a number of virtuosi had been involved in similar projects to construct a natural religion to which all rational persons could subscribe.[46] However, in 1691, booksellers were soon sold out of the first impression of five hundred copies, and the second impression as well, despite "there having been so much, so well written on this Subject by the most Learned men of our time; Dr. More, Dr. Cudworth, Dr. Stillingfleet, now Bishop of Worcester, Dr. Parker, late of Oxon, and to name no more the Honourable Robert Boyl[e], Esquire."[47] In the wake of the 'Providential Revolution', Ray became spectacularly successful in constructing a theological work with which all could agree. By providing arguments founded upon uncontested truths of natural history which could lead all men toward a fuller knowledge of God, *The Wisdom of God* persuaded Anglicans and dissenters alike to admit that God is in control and had a plan for mankind. Obedience and political submission to the newly appointed 'providential' order in church and state were no less important than religious submission to a parallel order in nature.[48] This shared belief was fully consonant with, and helped contribute to, the ideological unpinning used to legitimate the regime of William III, and further, this was a regime which had been fully and publicly endorsed by Ray. Thus, *The Wisdom of God* was neither a dubious and simplistic marriage of the categories of 'anglicanism' and 'ideology' nor a rigidly deterministic response to highly contingent circumstances. Rather, the *Wisdom* was a significant scholarly production within a specific context and a fully consistent individual response to urgent contemporary concerns.

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[42] Tillotson, *A Sermon Preached Before the House of Commons,* Sig. A3-A3v.

[43] Ray, *Wisdom,* Sig. A8.

[44] Ray, *Wisdom*, pp. 155-156.

[45] Brooke and Cantor, 'The Language of Natural Theology', *Reconstructing Nature*, pp. 176-206, esp. pp. 180-181.

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[46] Brooke and Cantor, 'Natural Theology and the History of Science', *Reconstructing Nature*, pp. 143-147.

[47] Ray, *Wisdom of God* (1691), sig. A5.

[48] Gillespie, 'Natural History, Natural Theology and Social Order', p. 45.

Ray, as well as many of his fellow virtuosi, were convinced that Anglican orthodoxy was necessary for the maintenance of a civil Society.[49] *The Wisdom of God* further demonstrated the usefulness of natural philosophy as an effective weapon against the threat of atheism, widely perceived as the greatest challenge to a safe and stable order in church and state. Much of *The Wisdom of God* therefore, was devoted to rehearsing contemporary arguments against the mechanical philosophies which were seen to limit the role of God in the world as a mere "Idle Spectator of this *Lusus Atomorum*, this sportfull Dance of Atoms, and of the various results thereof."[50] While Ray may have been prepared to accept that the physical world was composed of some sort of *minima* acting mechanically, the mechanical philosophy itself was an entirely insufficient explanation. Ray argued "So are there many *Phaenomena* in Nature, which being partly above the force of these *Mechanick Powers*, and partly contrary to the same, can therefore never be salved by them."[51] God, therefore, was necessary as the Final Cause of all motion, but life processes required a 'vital principle' which was entirely lacking in the 'dead and stupid matter' of the mechanists.

> But the greatest of all the particular *Phaenomena* is the Formation and Organization of the Bodies of Animals, consisting of such variety and curiosity; that these mechanick Philosophers being no way able to give an account thereof from the necessary motion of Matter, *unguided by Mind for Ends*, prudently therefore break off their System there, when they should come to Animals and so leave it altogether untoucht. We acknowledg [sic] indeed there is a *Posthumous* piece extant, imputed to *Cartes*, and entituled, *De la*

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[49] Brooke and Cantor, 'The Language of Natural Theology', pp. 195-200; Stewart, *The Rise of Public Science*, pp. 42-46; Gillespie, 'Natural History, Natural Theology and Social Order', pp. 1-49; Margaret C. Jacob, 'Christianity and the Newtonian Worldview', *God and Nature: Historical Essays on the Encounter between Christianity and Science*, eds. David C. Lindberg and Ronald L. Numbers (Berkeley, Los Angeles and London: University of California Press, 1986), pp. 238-255; Michael Hunter, 'Science and Heterodoxy: An early modern problem reconsidered", *Reappraisals of the Scientific Revolution*, eds. David C. Lindberg and Robert S. Westman (Cambridge and New York: Cambridge University Press, 1990), pp. 437-460.

[50] Ray, *Wisdom of God* (1691) p. 24.

[51] *Ibid.*, p. 26.

> *formation du Foetus*, wherein there is some Pretence made to salve all this by fortuitous Mechanism. But as the Theory thereof is built wholly upon a false supposition, sufficiently confuted by our *Harvey* in his Book of *Generation, that the Seed doth materially enter into the composition of the Egg*: So is it all along precarious and exceptionable; nor doth it extend all to the differences that are in several Animals, nor offer the least reason why an Animal of one Species might not be formed out of the Seed of another. Thus far the *Doctor*, with whom for the main I do consent. I shall only add, that Natural Philosophers, when they endeavour to give an account for any of the Works of Nature by preconceived Principles of their own, are for the most part grossly mistaken and confuted by experience.[52]

One of the most potent and frequently reiterated arguments against atheism was drawn from natural history. The belief that some plants and animals had a capacity to generate spontaneously without the agency or necessity of God, that is, "a production of a thing out of Nothing" was crucial for the atheist's case. If a being could be shown to have arisen independently of God's creation, then God's own unique creative capacity was denied and thus claims to His omnipotency as well. A convincing refutation of spontaneous generation was therefore central in the battles against the atheists. In the first edition of the *Wisdom of God*, Ray provided an extended discussion of "aequivocal" or spontaneous generation, where he insisted that all plants and animals arose from their biological parents. [53] Ray further censured "the Atheists nor mechanick Philosophers [who] have attempted to declare the manner and process of [generation] but have (as I noted before) very cautiously and prudently broke off their Systems of Natural Philosophy here, and left this point untoucht; And those Accounts which some of them have attempted to give of the formation of a few of the parts, are so excessively absurd and ridiculous, that they need no other Confutation than ha ha ha."[54] Ray referred to early experiments by the Royal Society on spontaneous generation[55] and he further cited Francesco Redi's well-publicized and unsuccessful attempts to produce maggots from putrefying dead flesh,[56] as well as Marcello Malphigi's fruitless trials to generate plants *de novo*.[57] In the second edition of the *Wisdom of God* (1692), Ray's additional arguments against spontaneous generation provided evidence from his own experiences and expertise, as well as from Leewenhoeck, Swammerdam and many others "unanimously of this Opinion." Ray himself was unambiguous in his opinion: "My Observation and Affirmation is, that there is no such thing in Nature, as aequivocal or Spontaneous Generation, but that all Animals, as well small as great, not excluding the vilest and most contemptible insects, are generated by Animal Parents of the same species."[58] The necessity to provide arguments against spontaneous generation was made explicit in the second edition of *The Wisdom of God*. Ray worried,

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[52] *Ibid.*, pp. 27-28. Ray's argument here continues for several pages.

[53] *Ibid.*, p. 221

[54] *Ibid.*, p. 217.

> A spontaneous Generation of Animals and Plants upon due examination will be found to be nothing less, than a creation of them. For after the matter was made, and the Sea and dry Land separated, how is the Creation of Plants and Animals described but by a commanding, that is, effectually causing the Waters and the Earth to produce their several kinds without any Seed? Now Creation being the Work of Omnipotency, and incommunicable to any Creature, it must be beyond the Power of Nature or Natural Agents, to produce things after that manner. And as for God Almighty, He is said to have rested from his Work of Creation

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[55] The Society had begun investigations into spontaneous generation as early as 1662, and continued to pursue inquiries into the matter for several years. Fellows involved in these early experiments included Merrett, Aubrey, Evelyn, Boyle and Willughby. See Birch, *History of the Royal Society* vol. I, pp. 117, 212-213, 238, Vol. 2, pp. 48, 50.

[56] Ray, *Wisdom of God* (1691), p. 221. "That noble Italian Vertuoso, Francesco Redi having experimented that no putrified Flesh (which one would think were the most likely of anything) will of itself, if all insects be carefully kept from it, produce any [spontaneously generated insects]."

[57] *Ibid.*, p. 222."For that great Naturalist Malphgius, to make experiment whether Earth would of its self put forth plants, took some purposely digged out of a deep Place, and put in into a glass Vessil, the top whereof he covered with Silke many times doubled and strained over it, which would admit the Water and Air to Pass through, but exclude the least seed that might be wafted by the wind' the event was that no Plant at all sprang up in it."

[58] John Ray, *Wisdom of God Manifested in the Works of Creation* 2nd edn (London, 1692), p. 71.

> after the Seventh Day. But if there by any Spontaneous Generation, there was nothing done at the Creation, but what is daily done, for the Earth and Water produced Animals then without Seed , and so they do still. First, Then I say, Such a Spontaneous Generation seems to be nothing less than a Creation. For, Creation being not only a Production of a thing out of Nothing less than a Creation. For Creation being not only a Production of a Thing out of Nothing, but also out of indisposed Matter, as may be clearly inferred from the Scripture, and is agreed by all Divines, this Spontaneous Generation, being such a Production, wherein doth it differe from Creation? Or what did God Almighty do at the first Creation of Animals and Plants, more than what (if this be true) we see every day done?[59]

On July 28, 1691, just two months after the first impression of the *Wisdom of God* had appeared at the booksellers, Robert Boyle added a codicil to his will which legally established a benefice for the Anglican church to support "some learned divine, or preaching minister" to defend Christianity against its detractors. Undoubtedly motivated by Boyle's own Christian piety and virtue, the endowment enabled the Church to provide a forum for chosen scholars to provide eight sermons a year on the Christian religion "to satisfy real scruples, and to answer such new objections and difficulties, as might be stated, to which good answers had not been made."[60] Thus, the Boyle Lectures were a legally-constituted ecclesiastical office of the Anglican Church. On 13 February 1692, Richard Bentley, chaplain to Edward Stillingfleet, would be chosen as the first Boyle Lecturer, and his lectures also were an entirely contingent response to complex theological issues of the period. Significantly Bentley, like Ray, would also deploy arguments from many aspects contemporary natural philosophy, a nontheological resource, to attack opponents of the Church. [61] Bentley's debt to the Raian natural history tradition is manifestly clear, albeit unacknowledged.[62] To be sure, Bentley's sermons on the "Folly and Unreasonableness of Atheism Demonstrated" did not offer the audience Ray's precision instrument to persuade and convince the waverer of the existence of God by demonstrated proofs of his existence. Rather, Bentley provided a blunt tool to reassure the committed Anglican in the correctness of his own anti-atheistic viewpoints. Nevertheless, spontaneous generation would form a central argument against atheism in the fourth lecture preached at St. Mary-le-Bow on 6 June 1692. Bentley confirmed "there is no one thing in the World, which hath given so much Countenance and Show of Possibility to the Notion of atheism, as this unfortunate mistake about the aequivocal generation of Insects."[63] Indeed, Bentley claimed the discovery that all creatures "are generated from Parents of their own Kind; Male and Female [was] . . . of that great Importance, that perhaps few Inventions of this Age can pretend to equal Usefulness and Merit; and which alone is sufficient (if the Vices of Men did not captivate their reason) to explode and exterminate rank Atheism out of the world."[64] The contemporary claim that plants could arise only from other plants, and by analogy animals could arise only from other animals, had been made by Ray in papers presented to Royal Society during the 1670s.[65] It is true that Bentley may have been made aware of the theological problems with spontaneous generation from John Evelyn, a trustee of the Boyle lectureship, who had also been involved with the early experiments by the Royal Society on this issue. By the same token, however, Evelyn would have known of Ray's papers before the Society on the generation of plants from seed, and therefore also known of the theological implications of Ray's claims.

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[59] *Ibid.*, p. 73-74

[60] Robert Boyle, *The Worlds of the Honourable Robert Boyle*, ed. Thomas Birch (London: J. And F. Rivington, 1772), I, clxvii.

[61] Kenny suggests that the use of a still by no means entirely respectable natural philosophy was a risky strategy, which could only have occurred with the sanction of Bentley's patrons, particularly Stillingfleet and Tenison. See Kenny. "Bentley's *Use* of Natural Philosophy', *Theology and natural philosophy*, SS 4.3.1.

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[62] Richard Bentley, *The Folly and Unreasonableness of Atheism Demonstrated From the Advantage and Pleasure of a Religious Life, the Faculties of Human Souls, the Structure of Animate Bodies, and the Origin and Frame of the World. In Eight Sermons Preached at the Lectures Founded by the Honourable Robert Boyle, Esquire* (London, 1693.)

[63] Bentley, 'A Sermon Preached at St. Mary-le-Bow, June 6, 1692', *The Folly and Unreasonableness of Atheism Demonstrated,* p. 22.

[64] *Ibid.*, p. 27.

[65] Ray, 'Of the Specific Differences of Plants' *History of the Royal Society,* ed. Birch, Vol. 4, pp. 162-173. Modern scholars continue to assign priority to Ray as the first to understand species as individuals having a common parentage, that is, to define species in terms of their biological relationship; Cain, 'John Ray on the Species', pp. 223-231; Mayr, *The Growth of Biological thought,* pp. 256-257.

It has become commonplace for some historians to insist on the importance of the Boyle Lectures as a platform to publicize the difficult philosophical views of a Cambridge mathematician.[66] Whatever the merits of this viewpoint, Bentley chose to promote precisely those features of Newton's natural philosophy which emphasized Ray's own arguments for an orderly and God-directed universe from evidence of God's contrivances. Furthermore, this use of Newton's natural philosophy as a manifestation of God's design in the world appears not to have been contemplated prior to the publication of *The Wisdom of God,* even by Newton himself; indeed, the first edition of the *Philosophiae Naturalis Principia Mathematica* (1687) contains only one reference to God. It was not until December 1691 (and prior to Bentley's formal appointment as Lecturer in February 1692), that David Gregory recorded "in Mr. Newtons opinion a good design of a publick speech (and which may serve well at ane Act) may be to shew that the most simple laws of nature are observed in the structure of a great part of the Universe, and the philosophy ought there to begin, and that Cosmical Qualities are as much easier as they are more

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[66] R. C. Jebb, *Bentley,* (New York and London: Harper and Brothers, 1899) pp. 19-32; Gerald R. Cragg, *Reason and Authority in the Eighteenth Century* (Cambridge: Cambridge University Press, 1964), p. 40; John J. Dahm, 'Science and Apologetics in the Early Boyle Lectures', *Church History* (1970), pp. 172-186; Margaret C. Jacob, *The Newtonians and the English Revolution 1689-1720,* (Ithaca and London: Cornell University Press, 1976 pp. 141-200; and Stewart, *The Rise of Public Science*, pp. 53-55, 62-66. The Boyle lectures as a platform for the promotion of "a moderate-Anglican social and political ideology underpinned by Newtonian natural philosophy" has been challenged by Christopher J. Kenney, *Theology and natural philosophy in late seventeenth and early eighteenth-century Britain* (Unpublished Ph.D. dissertation, Leeds University, 1996).

Universal than particular ones, and the general contrivance simpler than that of Animals plants &c."[67] It appears from Gregory's memorandum that Newton himself is suggesting that "his discoveries in celestial physics would serve the argument from design better than that reliance on the 'contrivances' in animals and plants used by John Ray in his *The Wisdom of God Manifested in the Works of the Creation,* first published in 1691."[68] Thus, it seems likely that Ray's central argument that knowledge of God's wisdom and power is provided by evidence from his creations, inspired the famous sixth Boyle lecture by Richard Bentley.

Furthermore, it was precisely Newton's theories of celestial physics about which Ray remained unconvinced. Certainly, the *Wisdom of God* is best known for its demonstrations of God's design in the world utilizing evidence from the knowledge domain we most closely associate with Ray, that is from his own expertise in natural history. Even in the first edition however, Ray saw the order and constancy of the heavenly bodies as a manifestation of God's counsel, wisdom and understanding. "And can we," Ray asked, "when we see the force of the Heavens moved and whirled about with admirable Celerity, most constantly finishing its anniversary Vicissitudes, to the eminent Welfare and Preservation of all things, doubt at all that those things are performed not only by Reason, but by a certain excellent and Divine Reason."[69] In the Second Edition, "very much enlarged," Ray again discussed "the Celestial or Heavenly Bodies, the Equability and Constancy of their Motions, the certainty of their Periods and

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[67] Jacob, *The Newtonians and the English Revolution*, pp. 154.

[68] *Ibid.* Given the success of *The Wisdom of God* in 1691 and 1692, we must also be cautious in accepting in its entirety Newton's later (and famous) claim to Bentley: "When I wrote my treatise upon our System I had an eye upon such Principles as might work with considering men for the beliefe of a Deity & nothing can rejoice me more than to find it usefull for that purpose"; from Jacob, p. 156.

[69] Ray, *Wisdom of God* (1691), pp. 45-51, 139-150.

Revolutions, the conveniency of their Order and Situations [and] argue them to be ordained and governed by Wisdom and Understanding; yea so much Wisdom as Man cannot easily fathom or comprehend.[70] Ray ascribed the constancy of the universe to a gravitational principle, "for the Stability and Perpetuity of the whole Universe, the Divine Wisdom and Providence hath given to the solid and Stable Parts a twofold Power, one of Gravity, the other of circular Motion."[71] Gravity, Ray believed, was the force that preserved the integrity of the stars and planets and prevented them from dissipating in the universe since "gravity unites and binds them up fast, hindering the dispersion of the Parts." [72] Ray however, was especially cautious to provide only those "proofs taken from Effects and Operations, exposed to every Mans view, not to be denied or questioned by any, [and] are most effectual to convince all that deny or doubt of it."[73] Thus, no doubt well aware of the negative responses to Newtonian theory by Leibnitz and Huygens, Ray chose not to provide an extended discussion of gravity, its operations or its causes, since, "for ought I have heard or read, the mechanical Philosophers have not as yet given a clear and satisfactory Account of it."[74]

II) The Miscellaneous Discourses

In 1691, the new king's plan for the Established Church was to remove William Sandcroft as archbishop of Canterbury for refusing to recognize William and Mary as legal sovereigns of England. The candidate William chose to implement his policies in the Church was the moderate John Tillotson, who was elevated to the office of the archbishop of Canterbury in April. As part of Tillotson's attempts to stabilize the new regime, he wrote to Ray in July 1691 with an offer for preferment in the Church. In the absence of any documentation other than an abstract of a letter which was destroyed by Ray's literary executor, an explanation of Tillotson's intentions or of Ray's refusal is speculative.[75] However, Tillotson's offer, which was widely discussed in London circles, was made a mere two months after the appearance of *The Wisdom of God* in May 1691, and therefore we may assume that the new archbishop did not disapprove of this work. In 1692, Ray would dedicate his second work of natural theology, the *Miscellaneous Discourses Concerning the Dissolution and Changes of the World* (1692) to Archbishop Tillotson, reminding his readers of their long friendship.[76] The second edition was published in 1693 as *Three Physicotheological Discourses*, again dedicated to the Archbishop. Tillotston, who must have been well versed in the complex system of scholarly rewards and protection that his patronage implied, at the very least acquiesced in having his name and ecclesiastical office associated with Ray's works.

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[70] Ray, *Wisdom of God* (1692) p. 53.

[71] *Ibid.*, p. 51.

[72] *Ibid.* , p. 51. Ray also described a universe in perpetual motion, including the motion of "the *Earth* (speaking according to Philosophical accurateness) doth move both upon its own Poles, and in the *Ecliptick*, is now the received Opinion of the most learned and skilful *Mathematicians*", p. 180.

[73] *Ibid.*, Sig. A5.

[74] *Ibid.*

The *Miscellaneous Discourses* was Ray's engagement in a highly politicized debate about theories of the earth. These debates absorbed the intellectual energies of a wide range of natural historians, mathematicians, astronomers, clergymen and 'wits' during the 1690s and represented an important episode in seventeenth century natural philosophy. All accounts of the history of the earth, of course, were founded on the biblical story of creation in Genesis which had the status of a truth revealed by God. A "proper" history of the earth therefore, also required the odour of orthodoxy. In the 1690s, the history of the earth debates were concerned with speculating on the processes which had shaped the known earth and which attempted to reconstruct the specific events in the historical record. Any interpretation of the history of the earth also had to account for both the nature of fossils and their disposition on the earth.

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[75] Letter to Tancred Robinson, 24 July 1691, *Further Correspondence*, p. 294. Lambeth Palace appears to contain no surviving correspondence to Ray and the few papers which survive from Tillotson's tenure in office are in code.

[76] John Ray, *Miscellaneous Discourses Concerning the Dissolution and Changes of the World, Wherein the Primitive Chaos and Creation, the General Deluge, Foundations, Formed Stones, Sea-shells found in the Earth, Subterra-neous Trees, Mountains, Earthquakes, Vulcanoes, the Universal Conflagration and Future State, and largely Discussed and Examined* (London, 1692), Sig. A3, A4. "My boldness", wrote Ray, "may pretend some excuse from ancient acquaintance."

In the 1690s, there was no consensus that fossils were the organic remains of once living creatures,[77] a fact readily admitted by Ray that "it is not yet agreed among the Learned, whether these Bodies, formerly called petrified Shells, but now a-days passing by the name of formed Stones, be original Productions of Nature, formed in imitation of the Shells of Fishes; or the real Shells themselves, either remaining still entire and uncorrupt, or petrified and turned into stone, or at least cast in some Animal mold."[78] Of course, Ray had already declared his own opinion that the most probable explanation for fossils which closely resembled living shellfish and other marine life was that they were "originally the Shells or Bones of living Fishes and other animals bred in the Sea."[79] Nevertheless, it was clearly understood by Ray and his contemporaries that this explanation of fossils could challenge the scriptural account of creation. Privately Ray worried that if 'the most different kinds of these [fossil] bodies' were living remains, "there follows such a train of consequences, as seem to shock the Scripture-History of ye novity of the World; at least they overthrow the opinion generally received, & not without good reason, among Divines & Philosophers, that since ye first Creation there have been no species of Animals or Vegetables lost, no new ones produced."[80] Evidence from the fossil record that some species had no modern counterpart, and so indicated that some species may have become extinct, was of particular concern.

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[77] On fossils, see especially Peter Bowler, *Evolution: The History of An Idea* 2nd ed (Berkeley, Los Angeles, London: University of California Press, 1989) and Martin Rudwick, *The Meaning of Fossils: Episodes in the History of Palaeontology*, 2nd edn ((New York: Science History Publications, 1976).

[78] John Ray, *Miscellaneous Discources Concerning the Dissolution of the World*, (London 1692) p. 104.

[79] Ray, *Observations Topotgraphical, Moral & Physiological*, pp. 121-131, esp. 121.

> Which Philosophers hitherto have been unwilling to admit, esteeming the destruction of any one Species a dismembring of the Universe and rendring it imperfect: whereas they think the Divine Providence is especially concerned to secure and preserve the Works of the Creation: and that it is so, appears, in that it was so careful to lodge all Land Animals in the Ark at the time of the general deluge.[81]

Natural philosophers also sought explanations for the specific distribution of fossil remains and especially their presence in mountainous areas. While most philosophers accepted some version of a great deluge as the mechanism to distribute the fossils, it was also necessary to reconcile the timing and duration of the flood with scriptural accounts. While the various competing theories all attempted to provide physical explanations for the phenomena, neither Genesis nor the new theories could provide unambiguous empirical evidence to determine the "correct" theory, a problem well understood at the time. John Keill admits: "I censur'd the *Theorist* indeed for inquiring into Physical causes, when there are none that can be known."[82] Thus, the controversy generated disagreement on a wide range of epistemological as well as theological issues, which would remain contentious throughout the eighteenth century and beyond. However, the further significance of the history of the earth debates in the context of Ray's career is that his reputation, the institutional affiliation and support he enjoyed, as well as the tacit acceptance of his geological views by Archbishop Tillotson, seem to have played a major role in the future survival of his views. When the geologists of nineteenth-century England came to pass judgement on the most popular theories of the earth, only Ray's version received approval.[83]

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[80] Letter to Edward Lhwyd, October 8, 1695, *Further Correspondence*.

[81] Ray, *Miscellaneous Discourses*, p. 117.

[82] John Keill, *An Examination on the Reflections on the Theory of the Earth, Together with a Defense of the Remarks on Mr. Whiston's New Theory*, (London 1699), p. 32.

By 1693 the alliance of Raian natural history with theology had become successfully established as a genuine and acceptable supplement to traditional modes of piety in England. The popularity of natural theology fostered an enthusiasm for natural history; nature history, in turn, helped to perpetuate the appeal of natural theology.[84] Importantly, the appearance of 'practical natural history' to transcend political and religious differences also made it an excellent vehicle to promote the ideological program of church and state in Augustan England. Thus, Henry Compton's instructions to the clergy of his diocese urged submission and a just deference to 'Authority' for the Lord's sake, since

> A truly humble Spirit will readily acknowledge that the Wisdom of God is above all; and that what God has Consecrated by his Institution is to be observed with Reverence and Submission. A Man of Just Sense and Reason will ask, what Familiarity or Communication our Gross Beings here upon Earth should have with Spiritual Things, were there not some visible *Medium,* in some manner to Qualifie and Reconcile the Invisible Operations of God to our Weak Understandings.[85]

Natural theology's apparent 'disinterestedness' therefore, offered a description of the 'natural' order in the universe which was used to justify the 'natural' order in church and state as well as in late seventeenth-century English society more generally. Nehemiah Grew's imitative contribution to the genre precisely captured the utility of natural theology for ideological purposes, and again serves to underline the importance of the 'appearances' of orthodoxy and political loyalty. Dedicated to William III, with a second dedication to both "Thomas [Tenison], Lord Archbishop of Canterbury and John, Lord Archbishop of York," Grew entitled his work, *Cosmologia Sacra; or a discourse of the Universe as it is the creature and kingdom of God. Chiefly written to Demonstrate the Truth and Excellency of the Bible; which contains the Laws of his kingdom in the Lower World* (London, 1701). We are not surprised to find that Grew's work was published by the Royal Society printers, who also issued a third edition of the *Wisdom of God* in 1701.

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[83] Charles Lyell, *Principles of Geology*, Vol. 1, (1830, reprint Verlag von J. Cramer, 1970). p. 35. Indeed, Ray's geological views had become scientific orthodoxy by the nineteenth century; Charles Lyell, like Ray, also insisted that the processes which we observe occurring naturally in the world, such as earthquakes, volcanoes and subsidence, were sufficient explanation for the past changes in the state of the world.

[84] Gillespie, 'Natural History, Natural Theology and Social Order', p. 3.

[85] Henry Compton, *The Bishop of London's Charge to the Clergy of his Diocese at his Visitation begun Ann. 1693 and Concluded Ann. 1694* (London, 1696), p. 35.

Conclusion

The rhetoric of Raian natural history presented a stable and consensual natural order which was precisely suited to urgent social concerns after 1688, and especially to the stabilization of the new political regime of William and Mary. The Royal Society, in its continuing efforts to become a legitimate voice for the proper investigation of nature, exploited the rhetoric of natural history to promote an uncontentious natural philosophy. In this period especially marked by competing claims for authority in church and state as well as in natural philosophy, natural history acquired a deliberate socio-political message and John Ray became firmly established as a legitimate spokesman for matters of natural history as well as for pressing matters within English society more generally.

Natural history had long been the source for the most persuasive arguments of God's wisdom and providential power acting in the world, and in the 1690s such ideas were most persuasively articulated in Ray's *Wisdom of God Manifested in the Works of Creation*, and his *Miscellaneous Discourses Concerning the Dissolution of the World.*

Wisdom of God especially united the theme of Divine Providence with notions of consensus, harmony and stability in nature and society and became an important intellectual resource during the eighteenth century.

CHAPTER 10

Conclusion

By 1700, Natural History was the common enterprise of an identifiable community of natural philosophers who were committed to precise first-hand observations and preoccupied with the importance of taxonomy, the natural philosophy which delineated the natural order and relations of things. The natural history project of John Ray, "the Great Botanist of our age,"[1] had become the template for the activity of natural history and in particular botany. The practices and protocols instituted by Ray and his community served to define both the knowledge domain of natural history and the proper conduct of the activity in all its varieties and manifestations during the eighteenth century. The rhetoric of natural history continued to prove its utility by providing arguments precisely suited to urgent social concerns in contemporary England.

Natural theology was justified as an instrument of Anglican piety, especially as a means to confirm truths which were revealed in scripture. Ray's personal credit as a legitimate spokesman for the proper 'Anglican' interpretation of nature, however, was not self-sustaining and would need to be maintained and reinforced by his friends and supporters. Indeed, the very success of Raian natural theology and its adaptability to serve social, political or religious objectives made it possible for Ray's reputation to be exploited for rival partisan or political ends. In particular, Ray's identity as a 'tru' though unworthy son of the Church by law establish'd' would be contested even before his death in 1705 by the dissenting community who sought to reinvent Ray as a nonconformist and appropriate his credit to their cause. It was therefore crucial for 'legitimate' interests to command John Ray's personal reputation and to maintain control of natural theology and its purposes.

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[1] Edmund Gibson, 'Preface', *Camden's Britannia (London 1695)* (London and New York: Johnson reprints, 1971). Gibson was, successively, Chaplain to John Tenison Archbishop of Canterbury (1698), rector of Lambeth (1703), Bishop of Lincoln (1716) and Bishop of London (1720). The scope of Camden's *Britannia* is indicated by its subtitle, 'A Chorographical Description of the Most Flourishing Kingdoms of England, Scotland and Ireland, and the Islands Adjoining, out of the Depth of Antiquity', first published in Latin in 1586, and later translated into English by Philomen Holland in 1610. The practicality and usefulness of Camden's *Britannia* as a historical guide to England provided a model for the Victorian County Histories of the nineteenth century, which continued to include descriptions of the remarkable topographical, genealogical, antiquarian and natural historical features of each region.

Raian Natural History in the early eighteenth century

The natural history community of the early eighteenth century increasingly promoted natural history and especially botany as legitimate and respectable. Hans Sloane would remain the strongest supporter of Ray's enterprise. Sloane promoted natural history, especially botany, throughout his career, which ultimately included appointment as physician to Queen Anne and later to George II, election to the French Academy of Sciences (1708), president of the Royal College of Physicians (1719-1735) and finally President of the Royal Society (1727-1740).[2] Sloane's important role in the stabilization of the discipline warrants further investigation, including the promotion of Raian botany and other collecting activities, his extensive correspondence network, and especially his priorities as President of the Royal Society and involvement in the overseas expansion of the British empire.

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[2] Hans Sloane, *Catalogus Plantarum quae in Insula Jamaica sponte proveniunt aut volgo coluntur* (London, 1696); Sloane, *A Voyage to the Islands of Madera, Barbadoes, Nieves, St. Christopher's, and Jamaica; with the Natural History of the Herbs and Trees, four-footed Beasts, Fishes, Birds, Insects, Reptiles, &c. To which is prefixed, An account of the Inhabitants, Air, Water, Diseases, Trade, &c. of that place, with some relations concerning the neighbouring continent and Islands of* America, Vol. I (London 1707), Vol. II (London, 1727); Munk, *Roll of the Royal College of Physicians*, Vol. II, pp. 460-467; Britten and Boulger, *Biographical Index*, p. 289; *DNB*, Vol. 18; E. St. John Brooke, *Sir Hans Sloane: The Great Collector and his Circle* (London: Batchworth Press, 1954).

Sloane, however, was not alone in preserving the Raian heritage. Ray's energetic contributor, the apothecary James Petiver, prepared both Latin- and English-language editions of *Mr. Ray's English Herbal,* illustrated with 600 copperplate figures and printed by subscription in 1715; in 1732 Sloane financed the reprinting of Petiver's English edition.[3] The eminent botanist William Sherard, fellow of St. John's College Oxford and English consul at Smyrna (1702-1718), had been Ray's indefatigable assistant for the third volume of the *Historia Plantarum* (1704).[4] A kinsman of Petiver's and brother of the apothecary James Sherard, William also initiated a project to revise Ray's valuable *Synopsis* of British plants, employing the German botanist Jacob Dillenius, for the task, and in 1724 the third, illustrated, edition of *Joannis Raii Synopsis Methodica* was printed by the Royal Society. Upon his death in 1728, Sherard endowed a Chair of Botany at Oxford, and Dillenius became the first Sherardian Professor there (1734-1747).[5] John

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[3] Keynes, *John Ray, A Bibliography*, pp. 89-90; Raymond Phineas Stearns, 'James Petiver: Promoter of Natural Science, c. 1663-1718', *American Antiquarian Society* ns LXII (1952), pp. 243-364, esp. p. 287.

[4] John Ray, '*Praefatio*', *Historia Plantarum*, Vol. III (London 1704). *Tandem Supplemento nostro complementum ultimum adjecit, plus mille Stirpium nondum editarum Auctario sponte & generose collato, consummatissimus Botanicus, per total Europam merito suo celebrrimus Amicus noster in paucis charus, D. Guilielmus Sherardus, LL.D. cujus praecipuae in hos opere partes fuere.*

[5] W. T. Stearns, 'Introduction' *Joannis Raii Synopsis methodica Stirpium Britannicarum (1724)*, facsimile edition (London: Ray Society, 1973), pp. 23-28; St. John Brooke, *Sir Hans Sloane*, pp. 182-187;

Martyn (1699-1768), although too young to be personally recruited to Ray's network, was invited in 1727 to lecture on botany at Cambridge on the recommendations of Sloane and Sherard, and later was appointed Professor of Botany (1732-1768). The textbook Martyn used for teaching his students was the *Methodus Plantarum circa Cantabrigiam nascentium'*; that is, Ray's own *Catalogus Cantabrigium* (Cambridge, 1660) in which Martyn classified the local plants according to Ray's method.[6]

Several measures in particular stabilized the discipline of natural history. Ray's classifications became the generally accepted methods for organizing nature among natural historians in England, and his *Historia Plantarum* became the standard botanical text of the eighteenth century. The Apothecaries' Physic Garden at Chelsea, first established in 1678 and managed during the 1690s by Ray's friends Samuel Doody and James Petiver, was purchased by Hans Sloane by 1720 and vested in the Apothecaries' Society in perpetuity. The Apothecaries garden, in close association with Royal Society botanists, evolved into *the* premier research and teaching facility of the early eighteenth century. By 1750, the Chelsea garden had reported at least two thousand previously undescribed plants to the Society and "botany, Sloane's favourite pursuit, was thus kept constantly before the eyes of the Fellows."[7] The Royal Society also worked toward formalizing the

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Raven, *John Ray, Naturalist*, pp. 249-250, 257, 303; Munk, *Roll of the Royal College of Physicians*, Vol. II, pp. 127-128. At his death in 1728, Sherard bequeathed his library, herbarium and 3000 pounds to the University of Oxford, which promptly invested the sum in South-Sea stock; Dillenius took up the professorship in 1734.

[6] *DNB* (1893), vol. 36, pp. 317-319.

[7] St. John Brooke, *Sir Hans Sloane*, pp. 117-120.

successful enlistment of overseas correspondents, already evident in the numerous citations in Volume III of Ray's *Historia Plantarum* (1704). Through the efforts of James Petiver, the Society actively recruited ships' surgeons to serve as observers and collectors on overseas voyages of discovery. The surgeons were provided with detailed, printed instructions on what to collect and how to preserve the specimens and pack them for dispatch to England, as well as a selection of equipment necessary for the task.[8] This program was so successful that the role of ship's surgeon *cum* naturalist became a standard feature on virtually all overseas voyages during the eighteenth century,[9] and the importance of 'economic botany' was fundamental to the successful expansion of British interests in overseas trade and colonization.[10]

The Raian paradigm of natural history continued to enjoy success as a means to structure and interpret nature in England throughout the eighteenth century, and botany in particular developed according to the foundation laid by Ray and his fellow travellers at the Royal Society. By the end of the eighteenth century Ray was seen as the 'founding father of natural history' in England, an enterprise above all concerned with observation and classification. According to William Smellie, in the *Philosophy of Natural History* (1799),

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[8] Stearns, 'James Petiver', pp. 243-364.

[9] For example, we need only recall that Joseph Banks, ship's surgeon to James Cook, received his botanical training at the Chelsea Garden and was President of the Royal Society for 41 years, from 1778.

[10] For the importance of 'economic botany' during the eighteenth century, see especially Richard Drayton, *Nature's Government: Science, Imperial Britain, and the 'Improvement' of the World*, (New Haven and London: Yale University Press, 2000).

> Natural history, toward the end of the last century, was powerfully recommended to the attention of mankind by the labours of our illustrious countryman, the Reverend Mr. John Ray; a man so remarkable for solidity of learning and correctness of taste, that, from perusing his valuable works, it is difficult to discover which of these respectable qualities shone most conspicuously in his character. Before this worthy's author's time, although, as we have seen, several laudable attempts were made to reduce the subjects of natural history to a kind of methodological arrangement, none of their authors seem to have had such comprehensive views of nature as to enable them to form a system founded upon solid principles. But as the character of Mr. Ray and of his writings are so universally known and admired, it would be superfluous to say any more on that subject.[11]

In 1844, amid widespread contemporary interest in the advancement of all aspects of science, the Ray Society was formed to honour "the most renowned of early English naturalists."[12] The aim of the Ray Society was "the promotion of Natural History by the printing of original works in Zoology and Botany; of new editions of works of established merit; of rare Tracts and MSS; and of translations and reprints of foreign works which are generally inaccessible from the language in which they are written, or from the manner in which they were published."[13] The membership of the Ray Society reflected the extent to which natural history was seen as a legitimate intellectual enterprise within mainstream nineteenth-century 'Anglican' science.[14] Prominent members included Sir William Jardine publisher of the 14 volume *The Naturalist's Library* (1833-1845), Thomas Bell who was not only president of the Ray Society (1843-1859) but as well President of the Linnean Society (1858-1861) and Secretary of the Royal Society (1848-1853), J. S. Bowerbank a highly respectable city merchant and distiller who also founded the Palaeographical Society, and the famous anatomist Richard Owen Hunterian Professor of Comparative Anatomy and Physiology at the Royal College of Surgeons and prime mover behind the proposed British Museum of Natural History. The Ray Society also attracted its share of aristocratic patrons as well as working scientists such as Sir William Hooker, first director of the Royal Botanic Gardens at Kew, the geologist Sir Charles Lyell and the renowned artist John Gould, author of eighteen monumental volumes of sumptuously illustrated works of ornithology. In other words, the membership of the Ray Society looked much like the scientific elites who populated other British scientific societies, a mixture of Oxbridge clerisy, London wealth, landed gentlemen, and amateur naturalists. Natural history was no longer the informal collection of virtuosi and clergymen of the seventeenth century, but was firmly established, respectable and institutionalized.

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[11] William Smellie, *The Philosophy of Natural History,* Vol. II, (Edinburgh, 1799), p. 43.

[12] Richard Curle, *The Ray Society: A Bibliographical History* (London: The Ray Society, 1954), p. 1.

[13] *Ibid,* 2.

[14] For interpretations of 'Anglican' science, see Jack Morrell and Arnold Thackray, *Gentlemen of Science: the early years of the British Association for the Advancement of Science* (Oxford,: Clarendon Press 1981), Adrian Desmond, 'The Making of Institutional Zoology', *The History of Science* 23 (1985) pp. 159-185 and 223-250; Martin J. S. Rudwick, *The Great Devonian Controversy: The Shaping of Scientific Knowledge among Gentlemanly Specialists* (Chicago: Chicago University Press, 1985) and Adrian Desmond, *The Politics of Evolution: Morphology, Medicine and Reform in Radical London* (Chicago: University Chicago Press, 1989).

Inventing John Ray

The importance of natural history was not limited to its achieving the status of a legitimate scientific discipline. Ray's *Wisdom of God Manifested in the Works of Creation* had used the observations of natural history to argue for God's design in the world, and it endured as one of the most frequently reprinted and widely read works on natural theology throughout the eighteenth century. Natural theology's adaptability to the service of social, political or religious objectives, however, also made the genre vulnerable to alternate interests who sought to use natural theology as well as Ray's own reputation to support a variety of partisan political or religious viewpoints inimical to Establishment positions.[15] It was therefore crucial for 'legitimate' interests to maintain control of both natural theology and the good name of Ray himself.

In 1702, Edmund Calamy published *An Abridgment of Mr. Baxter's History of his Life and Times. With an Account of many others of those Worthy Ministers who were Ejected after the Restauration of King Charles the Second. Their Apology for Themselves and their Adherents; containing the Grounds of their Nonconformity, and practice as to the Stated and occasional Communion with the Church of England. And a Continuation of their History, till the year 1691* (London 1702). Calamy was the leading spokesman for dissent in the early eighteenth century, and his apology was designed to publicize the cause in favourable terms during a period of renewed hostility toward nonconformity. The Dissenter's practice of occasional conformity to avoid restrictions on office-holding was a continuing irritation to conforming Anglicans and a Bill to end the activity had been introduced into Parliament. Fears of a Puritan resurgence and doubt over the succession to the throne also contributed to renewed persecution against Dissenters.[16] Further, Clarendon's royalist epic was printed, and the *History of the Great*

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[15] Brooke and Cantor, 'Natural theology and the History of Science', pp. 148-153; and Justin Champion, *The Pillars of Priestcraft Shaken* (Cambridge: Cambridge University Press, 1992), who described the attacks of the radicals on the Anglican Church.

[16] There was some justification for fears of renewed disorder from the Puritan left. See for instance Cotton Mather's anonymous *Eleutheria: or, An Idea of the Reformation in England and a History of Non-Conformity in and Since that reformation with Predictions of a More Glorious Reformation and Revolution at Hand* (London, 1698). Mather, who advocated the use of violence to achieve revolution, was a friend of Calamy's and sone of the prominent Puritan, John Mather, president of Harvard University, Boston. In

Rebellion (Oxford 1702) was dedicated to Queen Anne, his staunchly Anglican granddaughter. Clarendon's work not only served to resurrect historical religious and political divisions, but also demanded a response from the Nonconformist community, which Calamy was only too willing to undertake.[17]

Not surprisingly, Calamy's rationale for the foundations and principles of dissent provoked immediate controversy among the Anglican community. Parliament debated "The Church in Danger," sermons commemorated the anniversary of Laud's execution by the "Black Parliament" in 1642 and a letter protesting 'Certain Statements Affecting the Character of King Charles I contained in "An Abridgement of Mr. Baxter's History of his Life and Times"' was introduced into the House of Commons.[18] One anonymous account, a dialogue between Orthodoxus a Churchman, and Philoschistmaticus his Dissenting Friend, attempted to discredit nonconformity by charging the Puritans to be the cause of the fire of London in 1667.[19] Calamy responded to the contest with further *Defences of*

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addition, the death of the heir-apparent to England, the Duke of Gloucester in 1700, and the subsequent recognition by Louis XIV of James Edward Start as James III of England were among the political events which threatened political instability.

[17] Matthews, *Calamy Revised,* p. xvi; Geoffrey Holmes, 'Religion and Party in Late Stuart England; and 'The Sacheverell Riots: The Church and the Crown in Early-Eighteenth Century London,', *Politics, Religion and Society in England 1679-1742* (London and Ronceverte: Hambledon Press, 1986, pp. 181-215 and pp. 217-247; Charles W. Roundy, *Edmund Calamy (1672-1732): The Principles and Foundation of Dissent* (Unpubl. PhD Dissertation, University of Iowa, 1975), pp. 1-5. Roundy described how Calamy bribed the printing assistants at the Oxford press to smuggle individual sheets of Clarendons work to him.

[18] Charles Lesley, *A Case of Present Concern, in a Letter to a Member of the House of Commons on Certain Statements Affecting the Character of King Charles I Contained in "An Abridgement to Mr. Baxter's History of His Life and times, Etc.* (London, 1703).

[19] Philalethes, *Animadversions on Some Passages of Mr. Calamy's Abridgement of Mr. Richard Baxter's History of His Life and Times* (London, 1704).

Moderate Nonconformity in 1703, 1704 and 1705. The Anglicans countered with their own contributions to the lengthy debate including Benjamin Hoadly's various editions of *The Reasonableness of Conformity to the Church of England* (1703, 1707, 1712) and John Ollyffe's several *Defences of Ministerial Conformity to the Church of England* (1702, 1705, 1706). *The Sufferings of the Clergy* (London, 1714), a litany of the woes of Anglican priests during the Civil Wars and Interregnum by Tory High-Churchman John Walker, claimed that Calamy's efforts were in fact revived attacks on the Anglican ministry in the spirit of the Civil Wars. Walker warned, "the Case of Dr. Sacheverell being a Prologue, not altogether unlike to that which preceded the Tragedy acted on the Clergy from [16]40 to [16]60."[20]

Chapter Nine of Calamy's *Abridgment*, entitled "A Particular account of the Ministers, Lecturers, Fellows of Colleges, etc. who were silenc'd and ejected by the Act for Uniformity" was particularly offensive to the Anglicans. Calamy was especially concerned to characterise the ejected individuals as men of learning and piety who had suffered great hardships to uphold the principle of liberty of conscience,[21] precisely those Protestant Reformers who had been accused by the Anglicans of instigating the Civil Wars of the 1640s. Thus in 1702, Calamy enraged many by his attempt to "Canonize for Saints and Confessors, those very men . . . whose misguided zeal had filled the former age with

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[20] Matthews, *Walker Revised*, p. X.

[21] Roundy, *Edmund Calamy* p. 175. When it suited his purposes, Calamy suppressed discreditable information about some individuals.

Blood and Confusion."[22] What concerns us with Chapter Nine of Calamy's *Abridgment* is that he listed, without additional comment, "Mr. John Ray, MA Fellow of Trinity."[23]

We have no direct evidence of Ray's response. In 1704, however, Ray published the fourth edition of *The Wisdom of God*, complete with updated references to the Anglican community with which he wished to be identified, including the "Reverend and Learned Dr. Tillotson, the late Lord Archbishop of Canterbury, and Primate of all England," the "Right Reverent Father in God, John [Wilkins] late Lord Bishop of Chester," and "The Present Bishop of Worcester, Dr. Stillingfleet" who was one of "the most learned men of our time."[24] After Ray's death in January 1705, his friends, under the direction of Henry Compton bishop of London and Privy Councillor, were also careful to publicize Ray's orthodoxy: a monument erected at their expense at Ray's grave in Black Notley contained a Latin inscription of "his dying accents" declaring fervent attachment to the Church of England.[25]

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[22] Anon. *Seditious Preachers, Ungodly Teachers. Exemplified in the Case of the Minsters Ejected by the At of Uniformity, 1662, who Appear to have been the Only Trumpets to War and Incendiaries Toward Rebellion From Their Own Printed Sermons, and My Lord Clarendon's History. Opposed Chiefly to Mr. Calamy's Abridgement, Where he Has Canonized Them for So Many Saints and Confessors, to the great Encouragement of All Those Who, Shall Ever After Act by, and Avow the Rebellious Principles and Practices* (London, 1709), sig A2 and p. 1.

[23] Calamy, *Mr. Baxter's History*, (1702), p. 239.

[24] Ray, *Wisdom of God*, 4th edn (London, 1704), sig. A6, pp. 33-37.

[25] "*Hisce omnibus/Pietatem nimime sucatam adjunxit/Ecclesiae Anglicam (Id quod Supremo habita conformavit)/Totius & ex animo addictus.*" *Biographica Britannia* p. 3498. An English translation continues to adorn the interior of the Church of St. Peter and Paul in Black Notley, and translates the passage "England's best church engrossed his zealous care/ A truth his dying accents did declare".

These were measured responses to Calamy's accurate inclusion of Ray among those who chose to leave Cambridge in 1662. However, in 1713, Calamy published a second edition of his *Account*, now with an entirely separate volume containing extended biographies of the ejected ministers. Although Calamy withdrew the names of twenty-two individuals whom he had discovered to have conformed to the Church,[26] Ray's name reappeared with a commentary which aligned him with the Parliamentarian-appointed Master of Trinity Thomas Hill, also claimed unambiguously for the Puritan cause by his inclusion in Calamy's volume. Calamy further reminded his readers of Ray's friendship with Sir Philip Skippon, younger son of Philip Skippon (d.1659), one of Cromwell's Major Generals. Skippon's name would have been familiar in Puritan circles, although there is no evidence that Sir Philip was other than a loyal subject and conforming Anglican during the Restoration. Calamy also noted Ray's association with the Royal Society "of which he was a Member and a Great Ornament."[27]

The Royal Society had consistently attempted to position itself as an institution loyal to the crown and Church, and with the legitimate authority to pronounce on the correct interpretation of natural philosophy.[28] Calamy's claims for a Puritan Ray challenged their carefully structured public identity and a stronger response therefore was necessary to refute Calamy's assertions. This was undertaken by Ray's friends at the Royal Society, organized by Dr. William Derham, Ray's literary executor, Boyle Lecturer, Canon of Windsor and Chaplain to the Prince of Wales, later George II.[29] Almost immediately, Derham arranged a new edition of the *Miscellaneous Discourses,* complete with Ray's dedication to Archbishop Tillotson. Shortly thereafter, a slightly amended fifth edition of Ray's *Wisdom of God* (London 1714) appeared. Both works continued to be printed by official Royal Society printers. Derham's most direct response to Calamy however, was to publish the *Philosophical Letters of John Ray* (London, 1718), also printed under Royal Society auspices, which contained Ray's final confession and behaviour before the Reverend Mr. Pyke, Rector of Black Notley and Prebendary of Norwich. Pyke's account enumerated Ray's final requests which were "to read to him the Prayers of the Church, which in the Visitation of the Sick are appointed to be used by us; and the Absolution in particular he requested me to read." To remove all doubts of Ray's membership in the Established Church, Pyke also reported that Ray received Anglican communion, "the Sacrament of the Lord's Supper, which as it is men's Duty often to receive in the time of Health, so at the Hour of Death, he said, it was a necessary *Viaticum* for the great Journey he was now a going." Ray's last reported words incontestably declared his attitude toward dissent. "I am a Priest of the Church of *England,*" Ray

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[26] Matthews, *Calamy Revised*, p. xxviii.

[27] Edmund Calamy, *An Abridgement of Mr. Baxter's History of his Life and Times* (London, 1713), p. 87. "Mr. John Ray MA Trinity. He Preach'd Dr .Hill's Funeral Sermon in the College Chappel. He afterwards travelled with Mr. Willoughby and Sir Philip Skippon into Italy. He was a good Divine, and was an extraordinary Humanist as appears by his works'. After a list of twenty of Ray's works, Calamy continued, "He publish'd the Ornithologie of F. Willoughby Esq. In Folio, London 1676 in which he added the first two books, and he dedicated it to the Royal Society of which he was a Member and a Great Ornament".

[28] See for instance, Hunter, 'The Crown, the Public and the New Science, 1689-1702', *Science and*

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the Shape of Orthodoxy: Intellectual Change in Late Seventeenth century Britain (Woodbridge: Boydell Press, 1995), pp. 151-166.

[29] *DNB*, vol 5, pp. 842-843.

began,

> Ordained by *Dr. Sanderson*, then *Bishop of Lincoln*. That I did not follow the peculiar Duties of my Function more, is now the greatest Concern and Trouble to me. I do here profess, that as I have lived, so I desire, and, by the Grace of God, resolve to die in the Communion of the Catholic Church of Christ, and a true, 'tho unworthy Son of the Church by Law establsh'd in this Kingdom. I do think, from the bottom of my Heart, that its *Doctrine is pure, its worship decent, and agreeable to the word of God;* and in the most material Points of both conformable to the Faith and practice of the godly Churches of Christ in the Primitive and Purer Times. I am not led to this Persuasion so much from force of Custom and Education, as upon the clear evidence of Truth and Reason. And after a serious and impartial Examination of the Grounds thereof, I am fully persuaded, that the Scruples Men raise against joining in Communion with it, are unreasonable and groundless; and that the Separation which is made may very justly be charged upon the Dissenters themselves, as the blame-worthy Authors of it.[30]

After the death of Queen Anne in 1714 and the Coronation of George of Hanover, hostile public opinion toward the Dissenters moderated. Rather than unambiguously improving their fortunes however, the newly sympathetic political and religious climate was corrosive to the Dissenting movement. By the 1720s, according to Calamy's own account, it was riven with internal controversies and preoccupied with enforcing uniformity among its own members.[31] In 1727, Calamy published a third edition of the *Abridgement*, possibly in an attempt to stem the tide of dissenters from conforming to the Established church,[32] possibly to ensure continued sympathy from the newly crowned George II. Unwilling to relinquish Ray from the ranks of nonconformity, and illustrating the extent to which interest in Ray had obtained, Calamy declared in his introduction to provide convincing evidence on the matter of Ray's religious convictions. Calamy finally and reluctantly admitted that Ray may have been a lay-conformist, however he tempered his admission with the ultimate claim that, notwithstanding Ray's apparent conformity and public declarations to the contrary, "[Ray] could not comply with all that was necessary to full conformity." Calamy's conclusion was based on Ray's continued refusal to accept active service in the Church, despite Tillotson's offer of preferment in 1691. For corroboration of his claims, Calamy presented testimony which appealed to both an absent witness and an anonymous "one that knew him well, and that I think I can confide in."[33] Ultimately however, this 'evidence' was unconvincing, even for dissenters.[34] In a biography of Ray, Sir James E. Smith, first president to the Linnaean Society and himself a member of a dissenting congregation, was careful to reassure that his "reader must not suppose that [Ray] . . . was in the least degree, deficient in attachment to the doctrine or decipline [sic] of the Church of England."[35]

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[30] "Mr. Ray's Dying-Words , and Behaviour, before the Reverend Mr. Pyke, Rector of Black Notley, and Prebendary of Norwich', *The Philosophical Letters of John Ray*, ed. William Derham (London, 1718), pp. 374-375.

[31] Edmund Calamy, *An Historical Account of my own Life with Some Reflections of the Times I have lived in (1671-1732)m* Vol. II (London, 1830), pp. 401-419, 425-429 and 435-439

[32] *Ibid.*, pp. 502-506.

Throughout the eighteenth century, Raian natural theology continued to serve as the inspiration for discovering God's design in nature. The immensely popular *Wisdom of God Manifested in the Works of Creation* ultimately became a foundational text of natural theology and a vehicle which united the study of nature with the knowledge of God and his intentions. The importance of the parson-naturalist as 'scientist' and the parsonage as 'scientific laboratory' has only recently begun to receive scholarly attention.[36] However, Gilbert White's well-known *The Natural History and Antiquities of Selborne* easily attests to Ray's inspiration in the search for new evidences of God's wisdom in the world.[37] Sir James Smith also provided a fitting epitaph for Ray's *Wisdom of God*, the ultimate justification of utilitarian natural history, "known all over the world by its numerous editions and translations, and universally admired for its rational piety, sound philosophy and solid instruction. This book is the basis of all the labours of following divines, who have made the book of nature a commentary on the book of revelation, a confirmation of truths, which Nature has not authority of herself to establish."[38]

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[33] Edmund Calamy, *An Abridgement of Mr. Baxter's History of his Life and Times* 3rd Edn (London, 1727), pp. 120-122. Calamy used the testimony of Mr. Stephen Scandrett of Trinity College who had been forced to leave Trinity in 1660 for nonconformity by the then master, John Pearson.

[34] Samuel Palmer, *The Nonconformists Memorial: being an account of the Ministers who were ejected and silenced after the Restoration, particularly by the Act of Uniformity which took place on Bartholomew Day, Aug. 24, 1662* (London, 1775). Palmer accepted Ray's conformity on the basis of the Rev. Pyke's account, but still insisted that Ray had left Cambridge for reasons of conscience.

[35] Sir James E. Smith, *Rees Cyclopedia*, first American Edition, (1812), sv Ray. Smith's biography was also reprinted in Memorials of John Ray, ed. E. Lankester (London: Ray Society, 1848).

In the early nineteenth century, natural theology continued to prove its utility for promoting a particular vision of culture and social order,[39] and indeed, the genre was the vehicle of choice for Oxbridge-educated Anglicans who dominated the scientific scene in the first half of the century. From William Paley's classic *Natural Theology* (1802) to the famous *Bridgewater Treatises*, a series of eight works commissioned during the 1830s by the will of the Earl of Bridgewater, God's design was found everywhere in nature. Ray's *Wisdom of God* enjoyed its final resurrection in 1846 as a project of the Wernerian Society, utilizing the latest developments in Victorian science to illuminate God's handiwork, wisdom and benevolence.

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[36] Patrick Armstrong, *The English parson-naturalist: a companionship between religion and science* (Gracewing, 2000).

[37] Gilbert White, *The Natural History and Antiquities of Selborne,* intro. Ian Nial (London: The Folio Society, 1994), pp. 8, 28, 29, 33, 38, 44, 45, 46 53, 62, 66 67, and so on.

[38] Sir J. E. Smith, *Ree's Cyclopedia, sv* Ray (first US edition 1812), rpt *Memorials of John Ray,* ed. E. Lankester (London: Ray Society, 1848), p. 66.

[39] Bernard Lightman, 'Popularizing Victorian Culture', *Victorian Science in Context,* ed. Bernard Lightman (Chicago: University of Chicago Press, 1997), pp. 187-211.

Conclusion

At 1650, 'natural history' applied to a broad array of ill-defined activities, and 'natural historian' referred to a variety of individuals who by no means viewed themselves as a single community of scholars. There was neither a recognizable community of practitioners nor an agreed upon set of standards for its conduct. By 1700, Natural History was the common enterprise of an identifiable community of natural philosophers who were committed to precise first-hand observations and preoccupied with the importance of taxonomy, the natural philosophy which delineated the natural order and relations of things. Furthermore, members of the natural history community identified themselves with the scholarly tradition laid down in the last decades of the seventeenth century by John Ray. The reputation of the "pious and Rev'd Mr. Ray," a modest natural philosopher from rural Essex, as "the Prince of English Botanists" and the "British Aristotle" remained unchallenged throughout the eighteenth and nineteenth centuries. Ray's ultimate achievement however, was not merely to win acceptance for his principles of plant classification system in England or even the establishment of a specialist community of natural historians. Rather, what Ray achieved was to make natural history respectable. As long as England remained a haven for natural theology and Oxbridge privilege, natural history would be justified as a primary instrument to expand the knowledge of the natural world and the naturalists' task of describing nature's diversity and recording its particular intricacies and peculiarities seemed inexhaustible.[40]

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[40] By the end of nineteenth century, however, scientific communities in England experienced a social and intellectual transformation which accompanied the professionalization of the sciences. The story of the Victorian transformation of natural history is well told: see D. E. Allen, "On parallel lines: natural history and biology from the late Victorian period' *Archives of Natural History,* 25(3) (1998) pp. 361-371; Martin Fichman, 'Biology and Politics: Defining the Boundaries', *Victorian Science in Context*, ed. Bernard Lightman (Chicago: Chicago University Press, 1997), pp. 94-118; Adrian Desmond, *The Politics of Evolution: Morphology, Medicine, and Reform in Radical London* (Chicago: University of Chicago Press, 1989); Lynn K. Nyhart, 'Natural history and the 'new' biology', *Cultures of Natural History,* ed. N. Jardine, J. A. Secord and E. C. Spary (Cambridge, etc.: Cambridge University Press, 1996), pp. 426-443.

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